DECEMBER, 1958 • 35¢

AMERICAN

Cinematographer

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The Magazine of Motion Picture Photography

38th Anniversary Issue

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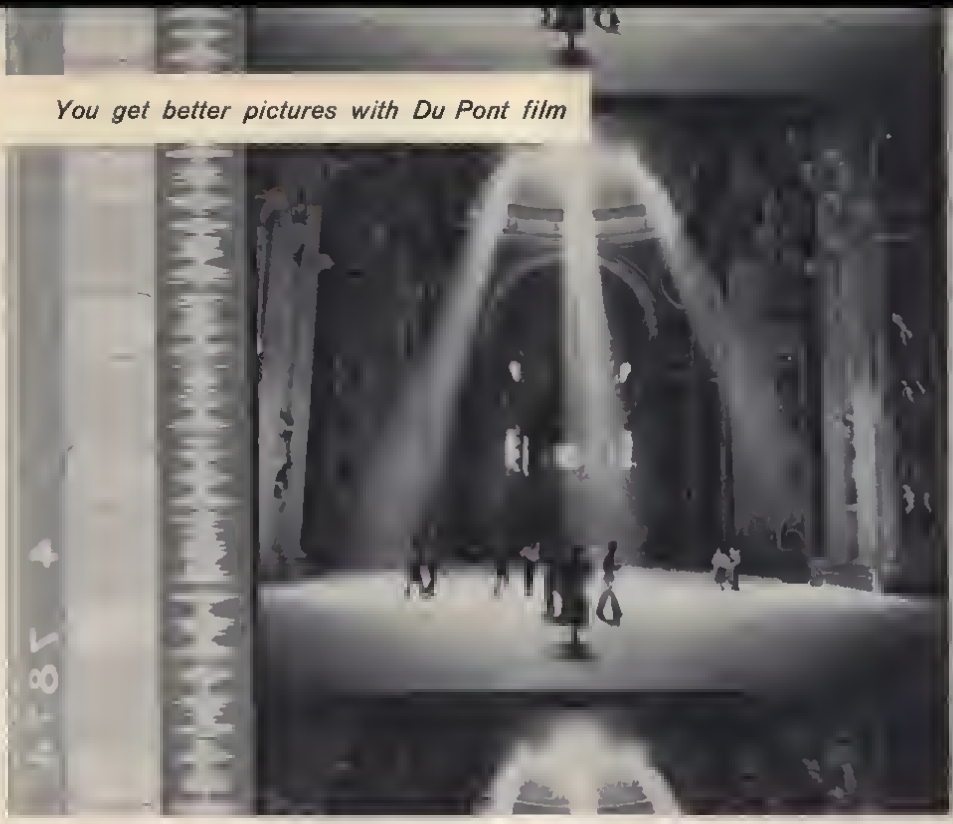

"For high speed and wide latitude... you can't beat 'Superior' 4"

Joe Vadala (right) and Director Martin Hoade are shown in the entrance of the Sistine Chapel.

says NBC's Joe Vadala, **cameraman for the TV series, "Rome Eternal"**

Du Pont Superior® 2 and Superior® 4 Motion Picture Films were used in shooting "Rome Eternal," presented on the NBC network in January. Co-produced by the National Council of Catholic Men and the National Broadcasting Company, the four half-hour films of "Rome Eternal" were shot on location in Rome by Mr. Vadala, under the direction of Martin Hoade.

An historical travelogue of the artistic, religious and cultural heritage of the city, "Rome Eternal" was largely filmed inside buildings—like St. Peter's Basilica, the Sistine Chapel, the Pantheon. In most cases, the light level was low, especially in the catacombs under St. Peter's.

"Without the combined speed and latitude of Du Pont film," says Mr. Vadala, "my job would have been a lot harder. As it was, I could count on the consistent quality of the film and I could be sure of getting what I saw in the finder—under any conditions."

In many sequences, such as the pageantry of important religious festivals, retakes would have been impossible. "When it was 'now or never'," concludes Mr Vadala, "I was glad that my camera was loaded with Du Pont film."

For features, newsreels, commercials—any shooting that demands a really fine film—there's an ideal Du Pont Motion Picture Film for the job For more information, call the nearest Du Pont Sales Office. Or write Du Pont, Photo Products Department, 2432-A Nemours Building, Wilmington 98, Delaware In Canada Du Pont Company of Canada (1956) Limited, Toronto.

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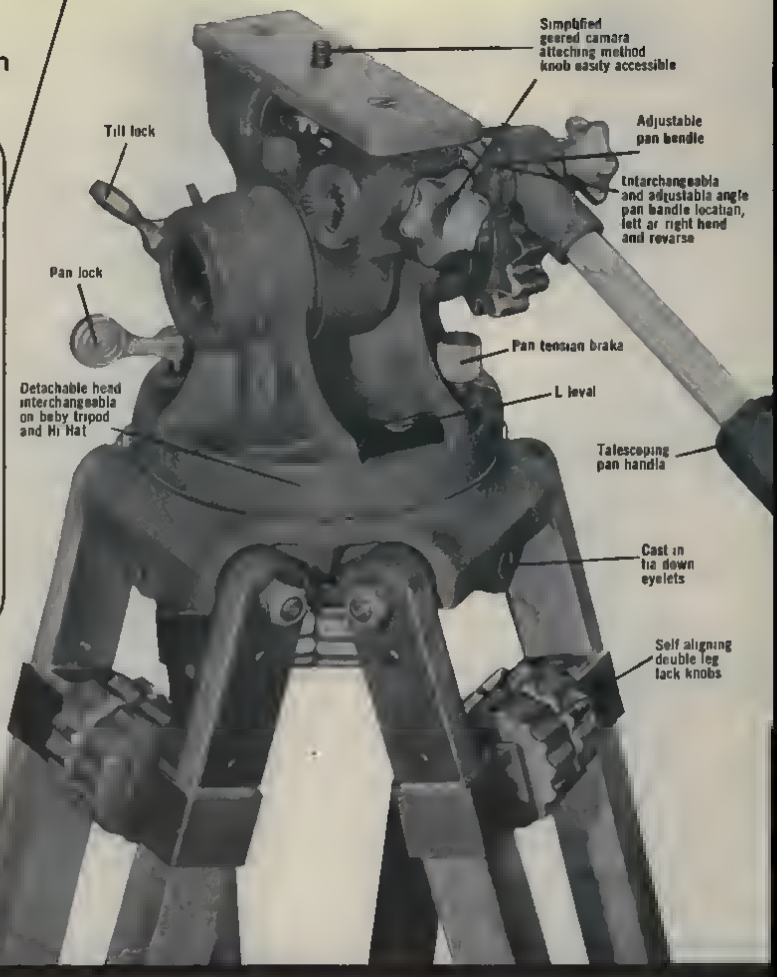
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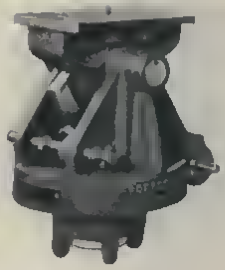

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AMERICAN
Cinematographer

December, 1958 • Vol. 39, No. 11

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ON THE COVER

MOTION PICTURE UNIT of Aerojet General Corporation s Solid Rocket Plant Sacramento, Calif prepares to photo graph scene of motor conditioning process of one of the company s rocket engines A 16mm Mitchell camera (center) and a 16mm Arriflex are set up to make a long shot and a closeup shot for matching action

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TOMORROW'S PHOTOGRAPHIC ASSIGNMENTS 684
The most rewarding opportunities for new motion picture cameramen lie in the fields of industry, science and defense

AUTOMATIC ELECTRONIC FOCUSING 686
A new development brings closer the day of complete automation for technical and industrial cinematography

CINEMATOGRAPHY—VITAL TOOL IN ROCKET MOTORS PRODUCTION 688
Often motion pictures are so essential in rocket develop ment and production that film requirements are written into contracts of the military services.

DO-IT-YOURSELF SOUND RECORDING 690
Part II in a new series for the small industrial and in plant film producer

ANIMATED FILM TECHNIQUES 694
Roles of the key animator and his assistants are defined in this fifth article in the series by Carl Fallberg

SINGLE-SYSTEM MAGNETIC SOUND 696
A new trend in TV news film photography initiated by NBC and CBS promises increased recording of sound with picture on pre striped negative

NEW LENSES FOR THE 16MM PROFESSIONAL 698
The new Kinetal series of lenses designed especially for professional 16mm cinematography by Taylor, Taylor Hobson Ltd are described

S O S.—SIGN OF SERVICE 702
Saga of one of New York City's leading suppliers of motion picture production equipment, that began with the advent of the "talkies"

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New equipment for makers of motion pictures

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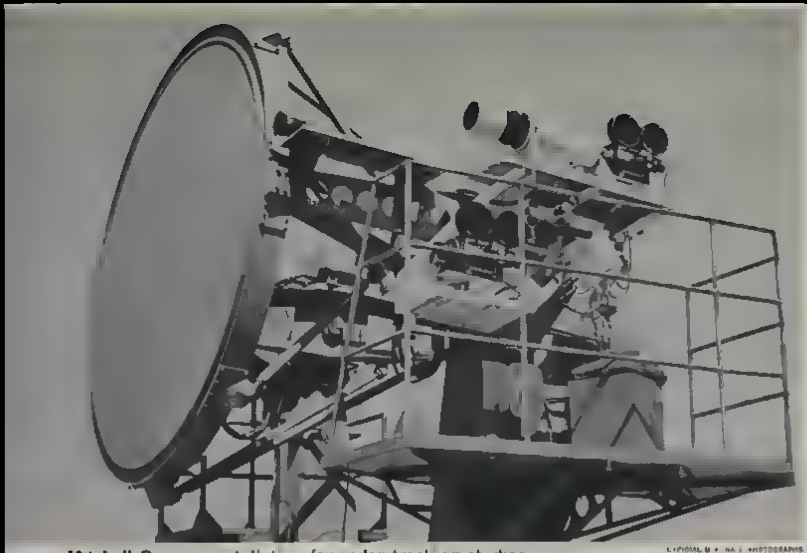
News and pictures about A S C. doings its members and industry personalities

EDITORIAL PAGE 683
New styling of American Cinematographer magazine and the advancing of issue date is explained by the Editor

EDITORIAL AND BUSINESS OFFICE 1782 NORTH ORANGE DRIVE, HOLLYWOOD 28, CALIFORNIA. TELEPHONE HOLLYWOOD 7-2135 AMERICAN CINEMATOGRAPHER established 1920, is published monthly by the A S C Agency Inc 1782 N Orange Dr, Hollywood 28, Calif Entered as second class matter Nov 18 1937 at the postoffice at Los Angeles Calif, under act of March 3 1879 SUBSCRIPTIONS United States and Canada $4 00 per year Foreign, including Pan American Union, $5 00 per year Single copies 35 cents back numbers 40 cents foreign single copies 40 cents back numbers, 45 cents Advertising rates on application Copyright 1958 by A S C Agency, Inc



Mitchell Camera installation for radar tracking studies.

HOW MITCHELL CAMERAS SUPPLY VARIED DATA IN ROCKETS AND MISSILES DEVELOPMENT

- Exact Pin Registration During Film Exposure
- Event Time to 1 Millisecond

Data dial instrumentation by Mitchell camera.

Extensive testing instruments incorporating Mitchell 16mm, 35mm and 70mm cameras provide key data at the U.S. Naval Ordnance Test Station at China Lake, Calif., one of the primary weapon development centers of the Navy's Bureau of Ordnance.

Fifty Mitchell 35mm cameras are used on radars, tracking camera mounts and fixed tripods to record missile and rocket development. Camera motors allow synchronous as well as in-phase operation of several cameras covering a test... important in film assessing. Eight 16mm Mitchell cameras are used for pictorial coverage of tests.

One metric photographic group shoots as much as 20,000 feet of 35mm film in one day. Other Mitchell cameras record underwater, engineering and aviation tests at this ordnance center.

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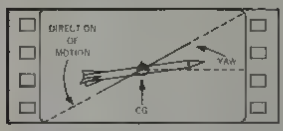
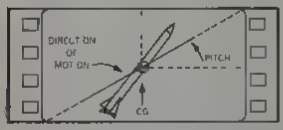
Cable Address "MITCAMCO"

85% Of Professional Motion Pictures Shown Throughout The World Are Filmed With Mitchell Cameras

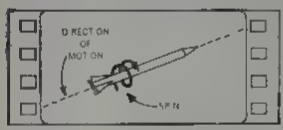
The Mitchell camera, by virtue of its exact pin registration during film exposure, allows these data to be determined to a reasonably high degree of accuracy through the use of film assessing equipment built to take advantage of this feature



Yaw—Side-to-side motion of missile

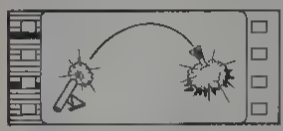


Pitch—Up-and-down motion of missile

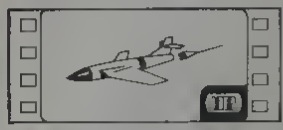


Roll—Turning motion of missile

Miss Distance—Gap between missile and target at point of interception.

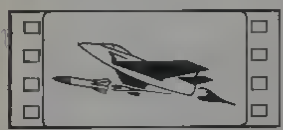


Flight Time—A series of lines on film, timed to accuracy of 1 millisecond



Position Data—Target location with azimuth and elevation readings

Pictorial Record—Record of all visible actions during test



Separation Data—High-speed separation actions for detailed study.

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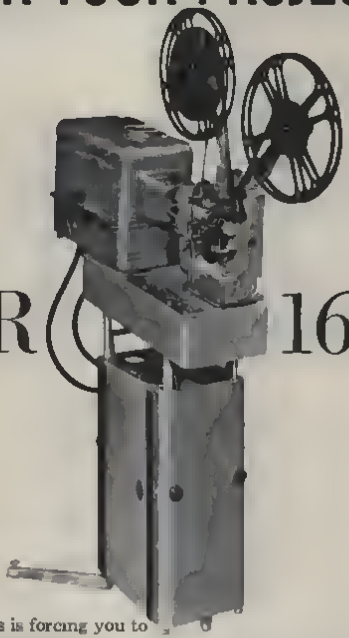


VICTOR 1600 ARC

If the high cost of 16mm arc projectors is forcing you to "make do" with an auditorium-type incandescent—you owe it to yourself to consider the Victor 1600 Arc. It delivers a full 1600 lumens of light on the screen at 30 amps with Mark II Shutter—more than three times that of any incandescent—yet it's still easier on your budget than other 16mm arcs. It incorporates all advanced Victor projector features and a powerful 25-watt amplifier. The 1600 Arc runs for a full hour on one set of carbons, does not require a special projection booth, and is the only arc projector made with 3-case portability.

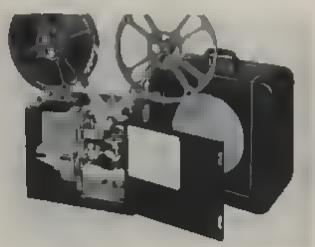
SPECIFICATIONS

Selenium Rectifier has top-mounted controls, swing-out legs, built-in tilt lock, is blower cooled. Also serves as base for projector

Speaker case houses 12" bass reflex speaker and is carrying case for 25-watt amplifier-projector unit

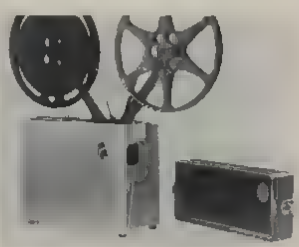
Lamphouse has built-in ammeter with motor rheostat, automatic carbon feed, external arc position marker

Compare the Victor 1600 Arc side by side with any other 16mm arc and see for yourself how much more you get for your projector dollar.



◂VICTOR SOVEREIGN 25

VICTOR MODELS FOR SMALLER AUDIENCES OFFER QUALITY FEATURES FOUND ON THE 1600 ARC



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INDUSTRY NEWS

News briefs of industry activities, products and progress

ED BENHAM, KTTV engineer, explains video tape editing to Chas. R Daily and Arthur Feindel, A.S.C

Seeing the editing problem as the main deterrent to expanding use of video tape in TV programming, engineers of two Los Angeles television stations last month set about with their staffs to lick the problem

KTLA's James Schulke assigned chief engineer John Silva and Paramount Sunset Studio's film editor Jerry Webb to a continuing experimental project to evolve a satisfactory editing method for video tape.

Intensive study is being made of NBC TV's simultaneous kine-taping process, in which a kinescope on film is used as a visual guide against which its companion video tape recording is edited

Engineer Silva believes the ultimate will be a multiple console setup whereby several tapes can be mixed or intercut and re-directed into a master tape.

In the adjoining KTTV studio, engineer Ed Benham has researched the video tape editing problem to the point where his editors can cut one tape into another in the middle of a scene, then cut back again without "going to black." This developement, said Benham, is important to the adaptability of video tape to motion picture techniques since it permits short takes and intercutting in the same manner as in conventional film production.

The technique presently employed at KTTV consists of working off the monitor and "rocking the tape" back and forth against the playback sound head until the desired cutting point is located and the cut made The method has not yet reached the point where cuts can be made on a word or syllable, as in motion pictures, but cuts can be made in the middle of a scene. Here cuts must be made between dialogue

The vid-tape editing problems are essentially the same as those that arise in trying to edit single-system optical sound films Benham believes that one solution to video tape editing will be to resort to the conventional motion picture method of putting the picture on one medium and recording the sound on another and separate one, so that each can be cut independently.

"It will be much simpler for us once a double tape system is put into use," Benham says.

In the meantime, the general reaction to video tape and its possibilities among those most interested in it seems to indicate that tape, in the forseeable future is neither the god-send video program men had hoped for nor the threat to their future that motion picture studio cameramen have so long feared

The industry tradepaper *The Hollywood Reporter*, in its October 27th issue stated "Although video tape recording—as recently as the beginning of this autumn season on TV—was hailed as the answer to all transmission problems, a sharp reaction already has set in . Many programs and even whole production operations which have been hailing the process, haven't Moreover, they plan to stick with film or live programming"

• • •

In an effort to bring about a "re-appraisal of the plight" of the American film worker, the American Society of Cinematographers last month went on record as joining the Screen Actors Guild and Screen Extras Guild in the principle of boycotting products of those who sponsor foreign-made TV film shows.

The A.S.C. issued a statement in which it declared that Society feels that the makers of products advertised on television depend on the American public to support their enterprise by

Continued on Page 664

the new AUTOMATIC

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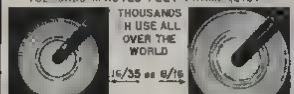

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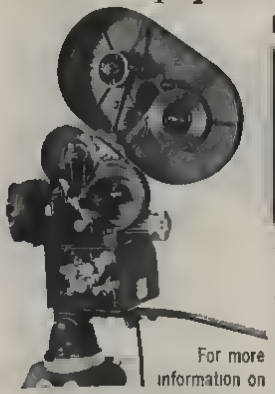

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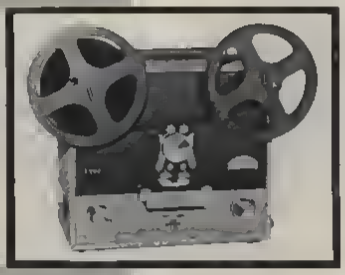

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AMERICAN SOCIETY OF CINEMATOGRAPHERS

1782 North Orange Drive • Hollywood 28, Calif.

INDUSTRY NEWS

Continued From Preceding Page

buying their products, and, therefore, it is only fair to expect their support of "our motion picture industry by sponsoring or having made especially for their sponsorship films produced entirely in the U.S."

The Screen Extras Guild, with the full backing of its sister union, Screen Actors Guild had earlier opened a pressure-group campaign designed to halt or slow the growing trend of U.S. producers going abroad to make TV films there with foreign casts and technicians.

• • •

The atmospheric effect that makes stars twinkle is a factor in the latest work on missile photography at Kodak Research Laboratories, Rochester, N.Y. The studies have provided new information about the film characteristics needed to photograph far-ranging missiles.

Two factors that affect the photography of missiles — atmospheric conditions and the diminishing size of the missile as it recedes from the firing point—are reproduced to scale in the laboratory, according to Kodak engineer Raife G. Tarkington.

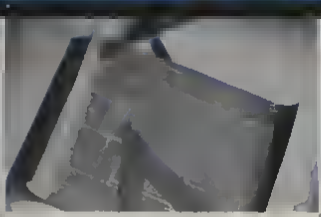
Atmospheric haze reduces the apparent contrast of the object, while atmospheric turbulence deteriorates the image formed by the optical system of the cameras used. Tarkington said. Thus in general, the effectiveness, resolving power, and sharpness of missile tracking films are improved as the film sensitivity decreases. Therefore, when photographing missiles, the "slowest" film that can be adequately exposed in the system should be used.

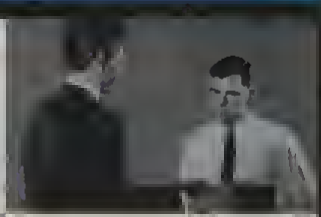
• • •

In a move that indicates the company's greater production stress on the Todd-AO 70mm wide-screen process, and less on the CinemaScope process which it pioneered, Twentieth Century-Fox is said to be acquiring a controlling interest in Todd-AO Corp. from Magna Theatres Corp., and American Optical Co.

The deal will give 20th first call on Todd-AO equipment which has been used to date in filming "Oklahoma," "South Pacific," and Mike Todd's "Around The World In 80 Days." Samuel Goldwyn's "Porgy and Bess" is now being made in the process, with Leon Shamroy, A.S.C., who photographed "South Pacific," directing the photography. •

PLANNING A LAB?





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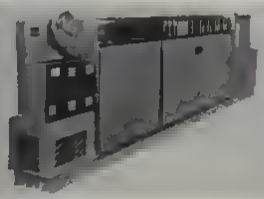

4 **PROCESSORS.** Houston Fearless builds the widest range of processing equipment, 16mm, 35mm, 70mm, B&W, color, pos., neg., rev., spray-type, from 5 to 250 fpm or will custom design for your needs.

5 **INSTALLATION** Complete installation service is available. Performed by experts who know the equipment intimately and who thoroughly check it out and test-operate it for perfect performance.

6 **PERSONNEL TRAINING.** If required, Houston Fearless will train your technicians in the best operating and maintenance procedures—important for achieving maximum lab efficiency.

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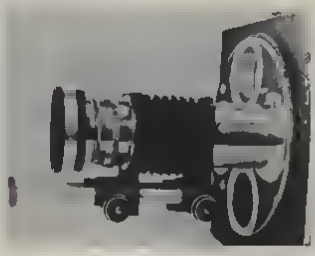

MITCHELL VARIFOCAL CLOSEUP UNIT Especially designed for Mitchell cameras to meet growing requirements in filming TV commercials. Also for macrophotography employed in research, instructional and scientific motion pictures. Unit contains its own lens. Eliminates set-up time previously required when extension tubes employed. Its deep drawn extension bellows permits infinite focus and affords a wide range of photography from normal (X1) to larger than normal (X10). Mitchell Camera Co., 666 W. Harvard, Glendale, Calif.

STOP-MOTION MOTORS. A new line of stop motion motors designed for fast, efficient operation of animation cameras. Available in five-, two-, and single speed units. The five speed motor has a frame counter and a dial for quick selection of forward speeds of 60, 120, 180, or 240 rpm, which can be changed without stopping. Instant rewind speed is 720 rpm, which saves considerable time when rewinding film in camera for double exposures and dissolves. Animation Equipment Corp., 38 Hudson Street, New Rochelle, N.Y.

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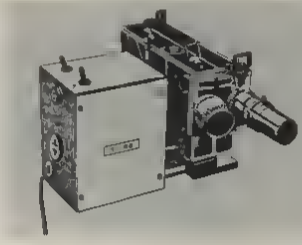

SPOT EXPOSURE METER Foto-Meter is designed to pin-point light readings of distant small areas with accuracy unattainable with conventional light meters. Will evaluate very small areas in a scene from any distance or camera position. Meter does not measure wide angle or scattered light and is not affected by background or other extraneous light. List price is $97.50. Camera Equipment Company, 315 West 43rd Street, New York 36, N.Y.

PAN-TILT HEAD Visco Matic is a precision made pan and tilt head designed especially for 16mm cameras such as the Cine-Special, Bolex H-16 Filmo, etc. used in professional work. Features velvet-smooth pan and tilt action through oil damped mechanism that provides three speeds for both movements, positive locks for both actions, all-aluminum construction and reversible handle for either left or right hand use. List price is $97.50. Santa Monica Photo Products, (Irving G. Ries) 1923 Colorado Ave., Santa Monica, Calif.

Continued on Page 668

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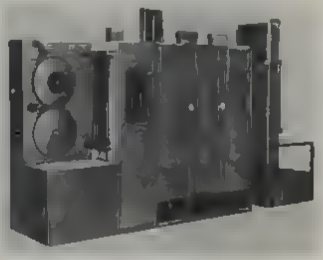
WHAT'S NEW

Continued From Page 666

PROJECTION SERVICE Hollywood Projection Service, Inc Hollywood 28, Calif, offers those in the film industry the following specialized projection room services 24 hours a day 35mm magnetic picture and track 35mm optical picture and track, 16mm Bell & Howell arc projectors, inside fader controls CinemaScope projection and projection in most wide-screen formats Theatre will seat 50 and free parking is available



RAPID SPRAY PROCESSOR New Model S 150R Filmline processor for 16mm and 35mm motion picture films Engineered for space and time economy Completely equipped, compact, heavy stainless steel construction Negative processing speed 100 ft per min Positive 150 ft per min No adjustments or flange removal necessary for conversion from 16mm to 35mm or vice versa Complete dry to dry processing cycle five minutes Other features Nylon and stainless steel ball-bearings, variable speeds 25 to 150 fpm temperature controls, minimum solution requirements, 6 gallons "Flo Jet" spray nozzles; and single panel switch control. For specs and prices, write Filmline Corporation, Milford Conn or Camera Equipment Co New York, N Y

GIMBAL TRIPOD Gyropod is heavy-duty, gimbal action tripod for use in shooting from boats yachts or rafts in open rough water Tripod will maintain camera on constant horizon in seas causing up to 30° inclination of supporting craft Screw-on threaded head takes either Mitchell or Pro Jr tripod heads for 16mm cameras Gimbal circles supported by ball bearings and stressed by 95 lb brass counterweight. List $945 00 Birns & Sawyer 8910 Santa Monica Blvd., Los Angeles 46, Calif

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MAGNASYNC FOREIGN DEALERS Magnasync Manufacturing Co Ltd., 5546 Satsuma Ave., North Hollywood, announces the appointment of dealers in 10 foreign countries. The ten dealers are located in Denmark, England, Belgium, Italy, Switzerland Mexico City, Thailand, Pakistan, Hongkong, and Canada Dealer names and addresses will be found in Magnasync's advertisement elsewhere in this issue ■

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- CARL GUTHRIE, ASC, "Battle Flame"

AMERICAN NATIONAL

- MONROE ASKINS "Bat Masterson"*, "MacKenzie's Raiders"*.
- LAMAR BOREN, "Sea Hunt"* (Ziv TV;
- CURT FETTERS, "Highway Patrol"*.
- BOB HOFFMAN, "Highway Patrol"*, "Sea Hunt"*, "Rough Riders"*, "Bold Venture"*
- JACK MARQUETTE, "Rough Riders"*, "Highway Patrol".
- RICHARD RAWLINGS, "MacKenzie's Raiders"*, "Rough Riders"*, "Highway Patrol"*, "Bat Masterson"*.
- CHARLES VAN ENGER, ASC, "Bat Masterson"*, "MacKenzie's Raiders"*, "Rough Riders"*

CALIFORNIA STUDIOS

- FLEET SOUTHCOTT, "Gunsmoke"*.
- STUART THOMPSON, ASC, "Have Gun, Will Travel"*

CASCADE PICTURES

- ELWOOD BREDELL, ASC, miscellaneous TV commercials.
- ROY SEAWRIGHT, TV commercials*.

COLUMBIA

- GERT ANDERSEN, ASC, "The Dorra Reed Show"*.
- WILFRED CLINE, ASC, "Justice Ends with a Gun"
- J. BURGI CONTNER, ASC, "Naked City"*
- RAY COBY, ASC, "Summer Camp", "Texas Rangers"*.
- HENRY FREULICH, ASC, "Shirley Temple's Storybook"*, "Alcoa-Goodyear Theatre"*.
- FREDERICK GATELY, ASC, "Father Knows Best"*
- BURNETT GUFFEY, ASC, "They Came to Cordura"
- JAMES WONG HOWE, ASC, "The Last Angry Man."
- FRED JACKMAN, JR., "Ed Wynn Show"*.
- IRVING LIPPMAN, "Behind Closed Doors"*, "Alcoa-Goodyear Theatre"*
- JOHN WILCOX, "The Mouse That Roared".

WALT DISNEY

- GORDON AVIL, ASC, "Zorro"*
- EDWARD COLMAN, ASC, "The Shaggy Dog"
- WILLIAM SNYDER, ASC, "John Slaughter"*
- HARRY WAXMAN, "Third Man on the Mountain".

FILMCRAFT STUDIOS

- VIRGIL MILLER, ASC, "You Bet Your Life"*

FOX WESTERN AVE

- GEORGE DISKANT, ASC "Dick Powell's Zane Grey Theatre"*
- FRANK REDMAN, ASC, "The Perry Mason Show"*
- GUY ROE, ASC "Wanted Dead or Alive"*, "Trackdown"*

GENERAL SERVICE

- BRYDON BAKER, "Bold Journey"*
- NEAL BECKNER, "The Adventures of Ozzie & Harriet"*.
- ARCH DALZELL, Nash Rambler commercial*.
- PEGGY FINNERMAN, '59 Plymouth commercial*,
- WILLIAM MARGULIES Kellogg commercial*
- JAMES VAN TREES, ASC, "The George Burns Show"*
- HARRY WILD, ASC, "Bob Cummings Show"*.

GOLDWYN STUDIOS

- NORBERT BRODINE, ASC., "Loretta Young Show"*.
- LEON SHAMROY, ASC, "Porgy and Bess" Samuel Goldwin Prods

INDEPENDENT

- JOSEPH BRUN, ASC., "The Last Mile."
- WILLIAM CLOTHIER, "The Horse Soldiers."
- FLOYD CROSBY, ASC, "The Wonderful Country."
- WILLIAM DANIELS, ASC., "A Hole in the Head"
- DESMOND DICKINSON "Horrors of the Black Museum."
- LEE GARMES, ASC "The Big Fisherman."

Continued on Page 678

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TECHNICAL QUESTIONS & ANSWERS

Conducted by Walter Strenge, A.S.C.

QUESTIONS relating to cinematography or other phases of film production are invited from readers and will be answered by letter by Walter Strenge or by other qualified members of the American Society of Cinematographers. Questions and answers considered of general interest will appear in this column.—*Ed*

Q When photographing titles, I would like to know how to produce shadow or bas-relief effect in the letters over a moving background. Can this be done by double-exposure? Can the same procedure be followed for both color and black-and-white titles?
—*B. B., Detroit, Mich.*

Answer: The shaded title effect can be achieved by a number of methods, three of which will be described here. The first step in all three methods consists of preparation of the title itself, which is generally lettered in opaque white ink on a clear panel of glass or acetate sheet. The shading or perspective shadow is then inked on the reverse side with opaque black color.

The first and most economical method of superimposing a title over a moving background is the direct photographic method in which the title is set up in front of the camera at the same time the background is photographed. By lighting front of the title in balance with the background and stopping the lens down as far as possible to carry focus, the entire job can be photographed in one operation. The black shading of the letters on the back of the glass will block out the background and produce the desired shadow effect.

In the second method, which is widely used, a camera having a bipack film magazine is employed, which acts alternately as a contact printer and as a camera. The title effect described is achieved by contact-printing a positive film of the title background onto a new negative along with the title.

The title, lettered on glass or acetate as in the first method, is illuminated from the rear for the first step of the operation. For this purpose reflected light is used—generally supplied by placing a white panel about two feet to the rear of the title glass and throwing light upon it of sufficient intensity to gain the desired exposure. In no case must any light strike the front of the title in this step.

The camera should be lined up so that the silhouette of the title image will print in the desired position over the background on the first pass of the camera operation. Result will be an exposed negative of the background with the title text along with its shadowed portion blocked out in silhouette.

The second step in this method records the title text on this negative in the area left unexposed in the first pass of the film through the camera. Here the positive of the background image is first removed from the bipack magazine and the exposed negative wound back to starting position. The illumination is now changed from rear to front, and a black velvet is placed immediately back of the title glass. Assuming that the camera is still in accurate alignment, a second pass is made with the camera to record the title over the background. Developing the film and printing to a positive will produce the desired title.

The third method is essentially the same as the second except that an optical printer is employed instead of a bipack camera. First the glass title is photographed twice with a conventional motion picture camera—once with the title illuminated from the rear (as in the second method) and once (on a separate negative) with the title illuminated from the front. Positive film prints of each negative are then used separately and alternately in the projection head of the

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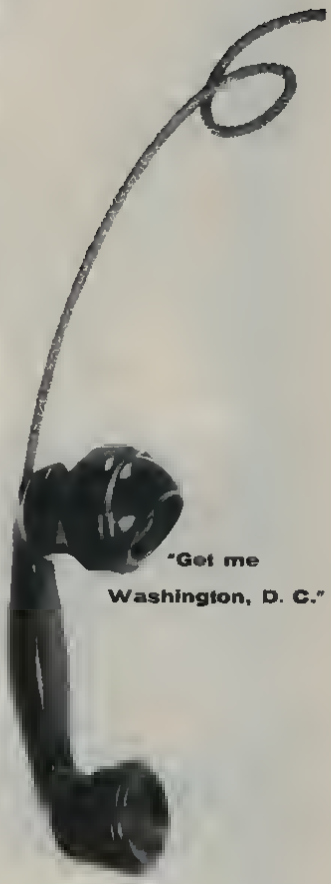

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FILM LABORATORIES, INC.

Sound • Editorial • Laboratory Services

1905 Fairview Avenue Northeast, Washington 2, D. C. LAwrence 6-4634

QUESTIONS & ANSWERS

Continued From Page 673

optical printer to produce a negative of the desired title

All of the above methods are applicable to color films as well as those in black-and-white *James Gordon A.S.C.*

Q My equipment consists of a Bolex H-16 camera, Model RT-80 Auricon sound recorder, Uhler contact (emulsion-to-emulsion) printer, and a Houston Model A-11 16mm processor. With this equipment is it possible for me to produce good sound prints? I'm puzzled as to how to proceed in putting the sound track on the picture print. Also, if I convert my Bolex camera for sound by adding a 400-ft. sync motor, would it be too noisy for sound work?—*R. S., Laurel, Miss.*

Answer: Starting at the beginning of the film production routine you have outlined, first we would recommend that you either purchase or rent a sync-motor driven camera; it would be faster and more economical than converting your Bolex H-16

The Uhler printer, if it's the continuous type having a sound printing aperture as well as picture aperture, will produce composite sound-picture prints that can be developed in your Houston processor

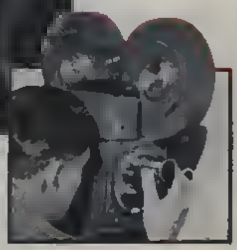
We would like to point out that only those individuals or companies requiring a large volume of prints find it economical to also do all their processing and lab work, and we would seriously recommend that, in the absence of skilled technicians with adequate facilities, it would be far more economical to have this work done in an established professional laboratory. Complete responsibility for all stages of film making is far too much for any one person. The procedure, for instance, of putting sound on the picture print involves many different skills that are available in most all film laboratories today. We would be happy to answer any specific questions on this subject for you, however —*Lou Vincent, A.S.C. Associate.*

Q Using a Filmo 70-DA camera having single-frame exposure release, what f/stop should I use for single-frame exposures with this camera, where same subject was shot at f/8 at 24 fps in the same light?—*J. J. L., Toronto, Canada.*

Answer: According to Bell & Howell Company, the exposure would be the same for single-frames as for 24 fps — f/8.—*Ray Mercer, A.S.C.*

Auricon Hollywood

"Auricon Pro-600" with Single-Lens "C" Mount, Tele-Finder Objective, plus Standard Auricon Finder



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(OR OPTICAL SOUND-ON-FILM OPTIONAL)

- Self-blimped for completely quiet studio operation. The whisper-quiet film flow of The "Auricon Pro-600" is silent proof of precision design. Your sound-recording microphone never picks up "Pro-600" Camera noise!
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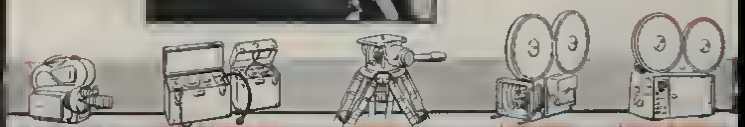
"Auricon Pro-600" features Push Button "On-Off," with safety-interlocked film-flow mechanism



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Mitchell single system with sound 4 Baltar lenses; viewfinder, motor, matchbox; cuncheder; 2 1000 magazines Reconditioned ... $4995 00

Wall single system with 3 lenses; viewfinder; motor; matchbox; cuncheder 400' magazines; case; bass sound $7,000 value Good condition ... $1195 00

Akeley Audio single system with 4 lenses and matched finders, motor, matchbox; synchedge; 2 1000 magazines; case; sound $6 000 value Excellent cond ... $895 00

B&H Eyemo Q w/3 lens spider turret motor mount; 2 lens 400' mag; drum finder Good cond ... $325 00

B&H Eyemo Q with 3-lens spider turret 3 lenses; 2 magazines; positive finder, 3 objectives; trunk Fine condition ... $495 00

Cunningham, portable w/3 lenses pilot pin movement; 110V motor, 200 mag. case Good cond ... $595 00

● CAMERAS 16mm

Auricon Pro 600 with 3 lens turret; galvanometer NR amplifier; present list approximately $4 500 Excellent condition ... $2995 00

Auricon Pro 200 with parallax finder, matchbox; cuncheder; case Less sound Good cond ... $495 00

Mitchell 16 with 220V 3ph synchmotor; 4 Baltar lenses; large viewfinder; 3 400' magazines, case $6 000 value Excellent condition ... $4495 00

B&H 70DA with 3 lenses; positive finder; objectives; case Good condition ... $295 00
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Maurer 05 with 2 magazines, 2 motors, viewfinder, cuncheder; trunk Excellent condition ... $2495 00

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(Baby Legs only ... $65 00)

Cine Special 100' chambers for single perforation Good condition ... $125 00

B&H 200 16mm magazines Good condition ... $99 50

Cineflex 35mm 200 magazines (Convertible to Arriflex) Good condition ... $19 50

Fen Cinor latest 17 5/70mm zoom type lens ... $369 50

Harrison K2 4" gloss filters in leather case $9 00 value New ... $1 95

Tripod Triangles prevent slipping, $30 00 value New ... $17 95
Tripod Triangles, used ... $13 50

Collapsible Tripod Triangles with tiedown clamps New ... $29 50

Dolly Track with connectors, 5 10-15 lengths per foot new ... $4 95
With self levelling screws, per ft, new ... $5 95

Photo Research Spectra 3 Color Meter with computer $350 value Good condition ... $195 00

Cinehed Type Collapsible Tricycle Jr Dolly Dem ... $65 00

Cinehed Type Sr Dolly Demondrator ... $67 50

S.O.S. Body Brace Camera Pods, from rental cloth Like new ... $24 95

Duraluminum Blimp, sponge lined for 1200 Maurer or other cameras with vertical mounted motor Good condition ... $149 50

Changing Bags, jumbo size, $15 val New surplus $4 95

Hi Hats for Arriflex 35mm New ... $28 50

Adapter for Auricon Pro-600 to accept 1200 magazines Permits double film capacity New ... $150 00

● CAMERA MOTORS

Cine Special, 12V variable with tachometer $350 00 value Good condition ... $195 00

Cine Special 110V AC synchronous $150 value Good condition ... $99 50

Mitchell NC 24V w/tachometer $525 value ... $325 00

Mitchell 110V AC/DC Wild Motor with tachometer $525 value Good condition ... $349 50

B&H 2709, 12V governor controlled Excel ... $195 00

Cineflex (Cameraflex) DC 12V & 24V New, shell worn ... $97 50

Richardson Animation Stop Motion for B&H 2709 110V start, stop, continuous single frame, reverse Frame counter $750 value Reconditioned ... $695 00

● ANIMATION & SPECIAL EFFECTS

Tel Animaprint Hot Press Outfit for making litho New ... $435 00
With Electronic Control ... $495 00

SOS Professional Titler & Special Effects Kit New—TG II ... $175 00
TG III ... $225 00
TG IV ... $325 00

Fomoco Tel Animo Scale Standard of animation today Regularly $2 50 New ... $1 25

Peterson Massive Animation Stand with motorized camera platen, all movements sliding celboard $d 500 value Like new ... $2750 00

Animation Art Tables with circular fluorescent litebox As is condition (Plus crating) ... $14 95

● LIGHTING EQUIPMENT

Mole Richardson 120 Amp Molarc (Type 90) on Pedestal with Grid & Cables $1,160 value Excellent condition ... $695 00

B&M Multiple Airport Battlite, 3 quadruple heads hold 12 bulbs on 15 rolling stand $300 value Like new ... $59 95
B&M 15 ft stands only ... $19 95

Kliegl 5000W Sr Spots on stands with casters, fine condition ... $149 50

Kliegl 5000W Sr Spots less stands Good cond ... $119 50

KNOCKDOWN PRICES ON FAMOUS GATOR GRIPS, BRAND NEW
Gator Grip, basic unit ... $ 2.75
Gator Grip w/cachet, 9 cord & switch ... $ 3.75
Gator Grip w/cachet, 9 cord & reflector ... $ 4.95
Gator Grip w/socket, 9 cord & barndoors ... $12.50

MR Twin Arc Breed on heavy stand, with ballast 35/40 amps $300 value, good condition ... $49 50

Cuholene Shadow Lighting Sets—3 Cookies Blade Flag, Target $25 00 value New ... $14 95

Dulling Spray—kills glare and annoying highlights 12 oz can, reg $1 95 Fresh stock ... $1 49

GE LAMPS, ALL NEW:
1000W T20 C13 Mogul Screw Reg $7 90 ... $2 95
1000W G48 C13 Mog Bipost Reg $15 25 ... $6 95
2100W T24 Mogul Bipost 60V Reg $22 50 ... $7 95

5 Lite Double Breads on stands $145 value Good condition ... $89 50

Colortran Spot Heads with barndoors Excel ... $ 14 95

MR 5000W #414 Solar Spot on stand Excel ... $195 00

MR 2000W #410 Solar Spot on stand Excel ... $ 99 50

B&M 2000W Spot on stand Excellent cond ... $ 99 50

B&M Double Breed on stand Fine condition ... $ 67 50

MR Type 1d Cinelite on stand Excel cond ... $ 39 95

B&M 750W Baby Keg less stand Excel cond ... $ 39 95

B&M Single Side Flood 10x12, less stand Fine cond ... $ 24 95

Three 10KVA Transformers with controls and 25 wire cable all mounted on cart Good ... $195 00

Beattie News Reel Floodlites on stands Excellent condition ... $ 29 50

● RECORDING EQUIPMENT

Single System 35mm Recording Head for B&H 270 camera with galvanometer Like new ... $395 00

Stephens Trucenic Wireless Mike Outfit Hec 2 invisible microphones; power supply; transmitter antenna and receiver $1,500 value Like new ... $495 00

RCA Photophone 35mm Optical Recording Heads, with 2 1000 magazines, optical system, galvanometer, lens, meter No license required Good ... $2995 00

Kleerex 4 position remote amplifier mixer $525 value Like new ... $249 50

Auricon BTBO Double System Optical Recorder with NR24 amplifier, mike and cables $1,000 originally Good condition ... $295 00

Western Electric d39 Cardioid Microphones $23d value Good condition ... $169 50

Magnetic Playback Unit for 35mm film phonoscription with preamplifier, transformer New ... $495 00

Revere 35mm Optical Recorder, with footage counter, tachometer; glowlamp; amplifier mixer Original $5 000 Needs repairs ... $195 00

● PROJECTORS, BACKGROUND, SCREENING and PREVIEW

Bodde 2000W P3AC Background Process Projector on rolling stand, with blowers, powercil, and 4 x5 slide carrier $945 value Excellent cond ... $495 00

Filmcraft 35mm Movie Background Process Outfit With lenses details $15,000 value Excel cond ... $4950 00

Holmes 16mm Arc Projector, with 15 amp rectifier, pedestal, amplifier; 212 speakers, lens Good condition ... $595 00

Walker Syncro Dynamic 35mm Theatre Type Sound Projectors Heavy Pedestal 3000 magazines built in High Fidelity soundhead Less lens and lamphouse Originally $1,500 New ... $395 00

Simplex Acme 35mm Sound Projector, complete with amplifier and speaker Excellent condition ... $495 00
(For second Acme Projector, add $300)

Holmes 35mm Sound Projectors, with 2000 magazines, lens; built in soundhead 1000W lamphouse Excellent condition ... $195 00

35mm Interlock Simplex Projector with RCA soundhead 2000 upper magazine preview magazine; 1500W lamp; lens; heavy pedestal, amplifier; two way speaker For screening previewing separate track and picture also recording $3,500 value Excellent condition ... $1995 00

DeVry Dual Projection and Sound Outfit $d 000 value Rebuilt like new ... $2495 00

Ampro Arc 16mm Sound Projector with Hi intensity arc lamp, lens; pedestal, 30A rectifier; 55W amplifier and 2 speakers Excellent condition ... $849 50

16mm Sound Projectors (Ampro, B&H, Victor) in operating condition from ... $95 00

GPL PA 100A 16mm TV Sound Projector with synchmotor; lens, pre-amp; all on one pedestal Capacity for 110 minutes running (3d00 reel) $2500 value slightly used ... $1 395 00

Videscope Professional 16mm Anamorphic Tokina and Projection Lens New ... $169 50

CLEARANCE!!!

● EDITING EQUIPMENT

Zeiss Moviescop 16mm Viewers with base and Precision Optical Sound Reader. List Price $310 New $279.50

S O S Jr. 16mm Action Viewer (Zeiss Moviescop) List Price $125 New $99.50

S O S Sr. 16mm Action Viewer, large 3" x4" picture with hold-down pressure pads. New Demonstrators. Limited quantity $124.50

Micro motorized 16mm picture viewer, with footswitch $250 value. Good condition $89.50

Kinavox Magnetic Sound Reader takes 17½, 16mm and ¼" tape. Demonstrator like new $110.00

Filmline 16/35mm Optical Sound Reader. Excellent condition $125.00

Neumade T-159-R Editing Table with light box, rack, 40"x28"x30" high. Originally $127.50. Used, as is $49.50

Nenmade 35mm two gang measuring machine with footage and frame counters. Used, as is $45.00

Micro four gang (2 16mm, 2 35mm) synchronizer with footage counter. Good condition $99.50

Feede 35mm two-gang synchronizer with footage and frame counter. Good condition $119.50

Schnen 16mm one gang synchronizer with footage counter. Good condition $65.00

Moviola 35mm two-gang late model synchronizer with footage counter. Like new $99.50

Nenmade 16mm two gang measuring machine. Excellent condition $49.50

Nenmade 35mm one gang synchronizer. Good $55.00

Nenmade 35mm one gang measuring machine. Excellent condition $49.50

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● MOVIOLAS & EDITING MACHINES

Moviola 35mm UCS 3 x4' picture on one side, optical and magnetic sound on other. No reel arms. Good condition $695.00

Akeley Editing Machine—does matching, spotting dubbing, synchronizing, etc. Footage and frame counters. Projects sharp 5 x7" picture. Variable drive 6/60 fps or constant 24 fps, 2000' automatic takeups and "slip-off" flanges. Cannot damage film. $3,000 value. Recently rebuilt $995.00

Moviolas UDCS Comperlite 3½ x4 picture and caned $1,500 value. Excellent condition $985.00

35mm Moviolas with 3" magnified Picture, automatic takeups, serviceable condition $189.00
(Add $125 for 3¼ x4 viewing screen)

Moviola DPV 35mm Preview Machine projects 8 x10 Image. Silent, with variable speed motor. Mounted on stand with casters. Originally $1,675. Like new $995.00

Acmiola CPH 35mm Preview Machine throws 6 x8½ image, w/reel arms, automatic takeups. Mounted on stand w/casters. $1,225 value. Like new $695.00

● CUTTING ROOM EQUIPMENT

B&H 36mm head splicers, $25.00 value. Good $4.95

Griswold 35mm splicers R 2. Good condition $15.95

Prestosenl Hot Splicers 16mm or 35mm optional. Excellent condition $395.00

Geared 35mm rewinds. Special Pr. New $15.95

Geared 16mm rewinds, Special Pr. New $17.95

Nenmade AS 16 Film Cement Applicators—$4.00 value. New $1.95

SOSoft Editing Gloves—light wt; doz. pair. Medium weight, doz. pair $1.33 / $2.39

Ready Eddy Film Editors calculator $2.00

Nenmade film storage racks and cabinets:
MM 102 Cabinets—hold 100 400' 16mm reels. Originally $195. Good condition $99.50
MM 184 Cabinets—hold 250 400' 16mm reels. Originally $330. Good condition $149.50
RK 102 Racks—hold 102 1000' 35mm reels (over 200 400' 16mm). Reg. $165. New $87.50

Ace Film Splicers, non-magnetic, butt or lap all sizes 8/16/35/70mm. DeLuxe Model. New 569.50
Standard Model, new $62.00

EZ 8/16mm Film Splicers, non magnetic, butt splice. New $50.00

EZ 8/16mm Film Tape Splicer. New $34.95

Knn Klenn Labels, box of 1000 35mm $1.49
16mm $1.19

Editors razor blades, finest quality.
Per 1000 $22.50; Per 100 $2.95

B&H Hot Foot Pedestal Splicer, 35 mm. Excellent condition $695.00
Combination 16/35, Excellent Condition $895.00

Chino Marking Crayons, brown ½ price, per doz. $1.00

Nenmood BTO-3 Rolling Film Racks, 3 tiers, hold over 500 16mm reels, $59.00 value. Good cond. $29.95

Sleeping Tape, black mylar, low sound track.
¼", per roll $1.79
12 rolls each $1.59; 36 rolls, each $1.50
½", per roll $2.64
12 rolls each $2.35; 36 rolls, each $2.25

● REELS, CANS, FILM CASES

400 ft 16 mm cans, like new. 500 for $39.95
100 for $9.50, 20 for $2.00

Nenmood 6" combination 16/35mm shipping flanges. Rennd keyway. New. Shelfworn $2.95

Plastic 35mm film strip containers. Fits open snap-shut with one hand. All colors (100 lots). New 08¢

16mm Fibre Shipping Cases. Dozen Lots. New.

	400'	800'	1200'	1600'	2000'
1 reel	$1.10	$1.35	$1.50	$1.75	$2.00
2 reel	1.20	1.55	1.65	1.95	2.35
3 reel	1.35	1.75	1.80	2.10	2.55
4 reel	1.50	2.25	2.05	2.35	2.75

Add 15¢ for handle. Prices F.O.B. Hollywood

Shipping Cases, Metal, for 10—16mm 400' reels. Surplus 29¢

Reels, 35mm 2,000' Aluminum, New, $4.95; Used, $2.49
2,000' Wire, New, $3.50; Used, $1.75
2,000' Spring Type Used 95¢
2,000' Exchange Type Used 79¢
1,000' Exchange Type, Used 59¢

B&H Eyemo 35mm 100' spools and cans. Good condition. Per set 25¢

● PRINTERS

Debrie 35mm sound and picture printer. Maitpe Model with light changer; $8,000 value. Good as is $1495.00

Acme Optical Dual Head 35mm Step Printer, for Cinecolor Orig. cost $14,000. Excellent cond. $3895.00

Depne Optical Reduction Sonodtrech Printer 35/16mm. Includes sync motor and generator. $7,500 value. Reconditioned $1995.00

B&H Model D 35mm feed and takeup sprocket; New, half price $29.50

Duplex 16mm Automatic Step Printer. Two positive printing machines on one pedestal. 2 40 scene automatic light change controls. Original cost $5,000. Good as is $1295.00
Duplex 16mm Automatic Step Printer, as above, reconditioned $2495.00

Cinecolor Double Head 35mm Step Printer with automatic light change and timing device. Original cost $12,000. Excellent condition $3375.00

B&H 35/16mm Picture Reduction Printer with 400W lamp, blower, contact and variable speed motor. Rebuilt $4895.00

Automatic Sub Tilling Machine with waxer, printer head; etcher; dryers de-waxer; washer; squeegee. Imprints 150 stencils in one load. Speed 60' per minute, plus $25,000 to build. New $9995.00

● FILM PROCESSORS

Houston K1A 16mm reversal processor with refrigeration; temperature controls; recirculation, air pump. Good condition $1495.00

Houston Fearless 16mm daylight loading magazines for all NF processors. $500 value. Good condition $79.50

Houston K 3 Processor, 16mm neg/pos/reversal, w/refrigeration; temperature controls; recirculation; air pump; stainless steel construction. Rebuilt like new $3195.00

Bridgematic Jr. 16mm neg/pos. Includes air pump; drain pump; stapler. $1,600 value. Good $975.00

Houston 35mm N-I Processors, neg/pos, with refrigeration; recirculating; air pump; temperature control. Speeds up to 1200' per hour. Government paid $10,000. Reconditioned $1895.00

Houston Rubber Squeegees, soft, pliable wiper blades for 16 or 35mm processors or cleaners. New, per dozen $1.30; per 100 $9.00

Micro Record 16/35mm daylight automatic processors w/3 routine tanks, motor driven. Demonstrators $1295.00

Sinaman 16/35mm Developing Outfits, 200' in case with loading device. $200 value. New, surplus $99.75

Sinaman Drying Racks 200' 35mm capacity (usable for 16mm). $10 value. New, surplus $7.95

Bridgematic Jr. Model K 16mm neg/pos, with spray wash; rotary air compressor; Graham variable speed transmission. Reconditioned $1225.00

Chemical Mixing Tank, stainless steel, capacity 110 gallons, mounted on angle iron stand. $163 value. Like new $139.50

● LABORATORY EQUIPMENT

Eastman Mark II B Time Scale Sensitometer. Motor driven drum and density wedges. Can be converted for color into Mark I-B with step tablets. Instead of drum $3,000 value, as is $895.00

Eastman Electric 35mm Film Waxing Machine w/heating element and motor. $1,500 value. Rebuilt $795.00

Hornfeld 1205 Scene Tester for B&W. Similar to Cinex. Color correction filter combinations available. Government surplus, looks complete. $2,500 value. $695.00

SOSOLVEX cleans, revitalizes film. Anti static, dries immediately. Safe, no dangerous fumes. No carbon tet. Non-toxic, non inflammable. 1 Qt. trial size $2.25; 1 Gal. cans, $6.95. 5 Gal. cans, per gal. $5.95; 55 Gal. drums, per gal. $4.96

Heavy duty 35mm Loop attachments. Ball bearing rollers. For elevators in lab or caned recording. Cost $500 to build. Like new $195.00

Mey 35mm Film Edge Numbering Machine. Excellent condition $1495.00

Nenmade CL 2 35mm film cleaning machines—2000' capacity. $425 reg. Surplus. Like new $295.00
(For conversion to 16/35mm add $50)

Moviter Film Gauge, measures shrinkage or stretching of 8/16/35mm film to 0.5%. $200 value. Like new $69.95

● TECHNICAL BOOKS, Reduced

American Cinematographer Handbook—8th Ed.	$ 2.35
UFPA Glossary of Production Terms	.50¢
NAVED Reference Projection Manual	25¢
Understanding Theatre Television—Nadell	25¢
Motion Picture Theatre Management—Carver	$ 3.49
The Audio Visual Reader—Kloepfer & McCluskey	$ 5.25
Elements of Mathematics for Radio, TV & Electronics—Fischer & Jacobs	$ 6.25
TV Stations—Duschinsky	$10.95
Stage Lighting—Bentham	$ 6.95
Television Writing & Selling—Roberts	$ 5.25
Handbook of Broadcasting—Abbot & Rider	$ 8.25
A Grammar of the Film—Spottiswoode	$ 3.50

● MISCELLANEOUS

Directors Chairs, folding, hardwood, canvas seat and back. White with red or black with white canvas. New $10.95

Highly refined lubricating oil for cameras, Moviolas, printers, recorders, projectors, etc. Per gal. 95¢

Veeder Seal 3 Digit Counters, ratchet type with reset. $20 value. Government surplus. New $1.95
3 digits; non reset, counts 1/10's, adds and subtracts used $1.95

Spirit Levels with mounting flange. Surplus 49¢

Storage Utility Boxes, two sections with heavy duty handles and clasps. Size 16 n14 x9½". Excellent condition. $2.75 each; 2 for $5.00

Syringe Type Oilers, visible oil supply. New $1.49

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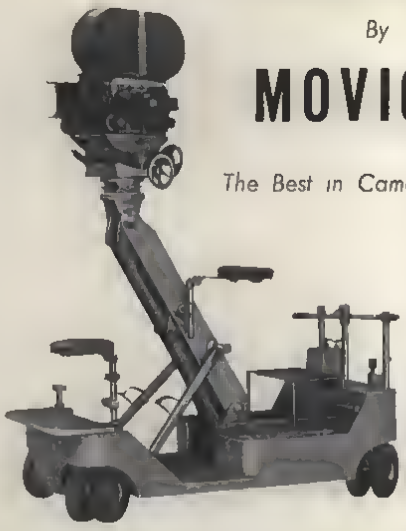

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PHOTOGRAPHIC ASSIGNMENTS

Continued From Page 670

- MALRY GERTSMAN, ASC, "Four Skulls of Jonathan Drake"
- JACK HILDYARD, "The Devil's Disciple"
- ERWIN HILLIER, "Shake Hands with the Devil"
- CHARLES LANG, Jr., ASC, "Some Like It Hot."
- LIONEL LINDON, ASC, "Alias Jesse James"
- MEREDITH NICHOLSON Dangerous Charter"
- JOHN NICKOLAUS, "Attack of the Giant Leeches," "Tank Destroyers"
- FEO PAHLE, ASC, "The Fourth Dimensional Man"
- ALAN STENSVOLD, ASC "My Pharaoh and the Cleopatra"
- GILBERT WARRENTON ASC, "Submarine X 2"
- FRED YOUNG, 'Solomon and Sheba."

KEYWEST STUDIOS

- WALTER STRENGE, ASC Series of Religious pictures (Family Films).

LINKLETTER PLAYHOUSE

- ALAN STENSVOLD, ASC, "People Are Funq"*

McGOWAN STUDIOS

- BRYDON BAKER, "Death Valley Days"*.
- WILLIAM BRADFORD, ASC, "Sky King"*
- RAY FOSTER, ASC, S & W Foods commercial*

METRO-GOLDWYN-MAYER

- ROBERT BRONNER, ASC, "The Mating Game",
- ROBERT BURKS, ASC, "North by Northwest"
- WALTER CASTLE, ASC, "The Beat Generation"
- WILLIAM DANIELS ASC, "Some Came Running," (Color) with Frank Sinatra
- GEORGE FOLSEY, ASC, "The Blessing"
- JOSEPH RUTTENBERG, ASC, 'Green Mansions"
- LESTER SHORR, ASC, 'Col Humphrey J. Fleck"*
- WILLIAM SPENCER, "The Thin Man"*,
- ROBERT SURTEES, ASC 'Ben-Hur" (Metrocolor camera 65, shooting in Italy).
- ALDO TONTI, "For the First Time", Technirama, shooting in Italy and Germony

MOTION PICTURE CENTER

- LUCIEN ANDRIOT, ASC, "The Californians"*.
- GEORGE CLEMENS, ASC 'The Millionaire"*.
- HENRI CRONJAGER, "Wyatt Earp"*
- ROBERT DEGRASSE, ASC "Danny Thomas Show"*.
- ROBERT HAUSER, "Derringer"*, "Man with a Camera"*
- SID HICKOX, ASC, "December Bride"*
- NICK MISURACA, ASC, "Desilu Playhouse"* (Desilu Prods.),
- KENNETH PEACH, ASC, 'Lassie"*

Continued on Page 724

ARRIFLEX SERVES TWA

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writes MR. J. G ARMSTRONG, SUPERVISOR VISUAL AIDS,
Flight Training Center, Trans World Airlines, Kansas City, Mo.

"...I have used the Arriflex before, and found it to be exactly what I needed to produce the movies which we use in training our pilots. Our pictures are taken with the Arriflex mounted so as to shoot out of the first officer's forward windshield panel. Due to the fact that a Connie cockpit has practically no room overhead, the Arriflex is mounted upside down and is operated running in reverse. A Filmorama anamorphic lens is mounted ahead of an Arriflex 28mm lens.

We have found that the Arriflex's registration pin eliminates any difficulties which might result from the gravity sensitivity of the camera's moving elements in flight. This is important since the camera is subject to varying forces in flight, especially at the low levels we use for photographing instrument approaches to airports..."

Ready for action John Armstrong, Supervisor Visual Aids, is shown in typical "shooting" position in the co-pilot's seat of the TWA route survey plane. (TWA Photo)

Only the Arriflex 16 has the features which make this camera so valuable to TWA! Light weight and compact, 400 ft. magazines, registration pin film transport, reverse filming, electric motor drive and last but not least, mirror-reflex shutter (not a beam splitter) for through-the-lens focusing and viewing.

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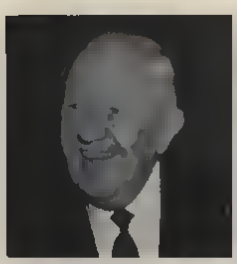
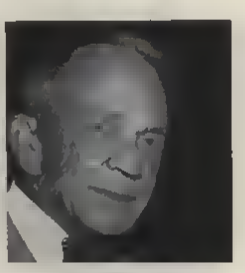


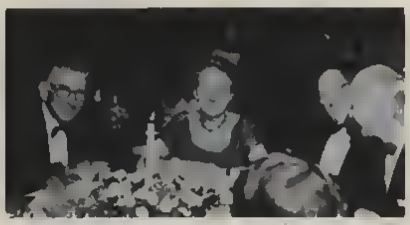
EDWARD O BLACKBURN—Honored member of the A.S.C., feted last month

EDGAR BERGEN and pal Mortimer good-naturedly kidded guest of honor Edward O Blackburn

EAST COAST cameramen Sol Negrin (L) and Jack Etra (R) were guests of A.S.C. Prexy Walter Strenge, center



ROY OVERBAUGH — One of 38 A.S.C. members given 25-year Gold Card



TYPICAL TABLE of merrymakers at A.S.C.'s Annual Ladies' Night Dinner and Dance, October 11. From left are John Arnold, Mrs. Arnold, Arthur Miller, and George Folsey

DURING RECENT visit to Mexico City, Bob Pittack, A.S.C., and Mrs. Pittack were hosted by A.S.C.'s newest member, Mexican cameraman Carlos Carbajal (2nd from left) and Mrs. Carbajal (right)

The American Society of Cinematographers, at its November meeting in Hollywood, paid tribute to an outstanding business figure, who is also one of the Society's Honorary Members, and to thirty-eight veteran members of the A.S.C. who joined the organization 25 years ago or more.

Engraved, gold 25-year membership cards commemorating the occasion, were presented to Lucien Andriot, Norbert Brodine, Edward Cronjager, Russell Culley, Robert De Grasse, Paul Eagler, Farciot Edouart, Max Fabian, Henry Freulich, Sol Halprin, Russell Harlan, Sid Hickox, James Wong Howe, Benjamin Kline, Milton Krasner, Harold Lipstein, Jack MacKenzie, J. Peverell Marley, Harold Marzorati, William Mellor, Russell Metty, Virgil Miller, Nick Musuraca, Harry Neumann, Roy Overbaugh, Robert Pittack, Gordon Pollock, Frank Redman, Irving Ries, Clifford Stine, Archie Stout, Leo Tover, Tom Tutwiler, Paul Vogel, Albert Wetzel, Lester White, Harry Wild, Bill Williams, and Rex Wimpy.

Honored guest of the evening was Edward O. Blackburn, an Honorary Member of the Society for more than 25 years, and Vice-President and General Manager of the Hollywood office of W. J. German, Inc., the California corporation, distributors of Eastman professional motion picture film.

Walter Strenge, A.S.C. President, in behalf of the Society, presented him with a memento commemorating the anniversary of his entrance into the Society as an Honorary Member. This was an engraved gold currency clip mounted with a 20-dollar gold-piece bearing the mint date of 1888, the year of his birth.

In his address, Mr. Blackburn told the cinematographers: "I am openly and avowedly dedicated to spending the rest of my days to helping the men who have helped me throughout my entire business life—the cameramen."

He then restated his well-known contention that "the cameramen of Hollywood do not realize what they are giving in service and value to the industry," and strongly urged the A.S.C. to set up a plan for world-wide publicity and exploitation of its members, to augment what is done in this respect by its publication, *American Cinematographer*.

Being a seller of film to Hollywood's studios and producers of TV films, Mr. Blackburn had a word to say regarding the so-called threat of video tape.

"We are not at all concerned about the media of transmission which may be used in the future for television and theatrical motion pictures," he said. "I think we shall have some tape, which will be used at various times and for various purposes throughout the television industry. But we shall always have film.

An interesting sidelight on the comparative remuneration of cinematographers compared with that of the stars

Continued on Page 726

Success assured . . . with *Ansco*

Fine motion picture films are usually those films specifically designed to do special jobs.

That's part of the reason for the success of Ansco's 16mm Anscochrome Professional Camera Film Type 242. Here is a film that has been perfected for the one purpose of producing low contrast originals with the finest possible print-through characteristics obtainable.

Type 242 offers reds and flesh tones of unparalleled beauty, blacks having high D-max and saturated, rich, color tones throughout the entire spectrum.

If you haven't as yet used Ansco's Type 242 along with Ansco Type 238 Color Duplicating Film, you're missing the best team ever produced for sheer color quality.

Why not contact your local Ansco representative today and ask him to demonstrate the vast possibilities of these two great emulsions. You'll be glad you did. Ansco, Binghamton, N. Y. A Division of General Aniline and Film Corp.

Ansco

Professional Motion Picture

New! ARRI 1000 FT. BLIMP FOR ARRIFLEX 35

The new 1000 ft. Blimp converts the ARRIFLEX 35 into a full-fledged SOUND STUDIO CAMERA, and brings further versatility to the ARRIFLEX 35 system. It accepts the ARRIFLEX 35 with regular synchronous motor, and utilizes standard Mitchell magazines, which are joined to the camera by means of an adapter, supplied with the Blimp. No alterations are necessary on the ARRIFLEX 35 or the Mitchell Magazine. No tools are needed. It takes but a few minutes to change the ARRIFLEX 35 from hand camera to studio camera or vice versa.

Features:

Modern acoustic damping methods afford extreme sound absorption. Permits use of microphones within 3 ft. of Blimp.

Remote focus drive from 3 positions.

Remote diaphragm adjustment.

Through-the-lens-focusing and viewing.

Matte box with leather bellows adjustable by geared struts.

Large front port permits use of 18mm wide-angle lens.

Adapter available to use anamorphic lenses.

Built-in filter holder for 3x3" filter.

Large Control windows for distance scale, diaphragm scale, footage counter and tachometer.

Wired for buckle switch which can be built into existing cameras and is factory supplied with camera if bought with Blimp.

ARRI-Precision Engineered for a lifetime of trouble-free service.

$3,995.00 FOB N.Y.

A complete sound camera outfit: Arriflex 35, lenses, synchronous motor, magazine, ready to shoot, can be purchased for less than $7,000.00! Available on convenient long-term lease plan with option to purchase.

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FROM THE DESK OF THE EDITOR

Like Our New Dress!

If this issue of American Cinematographer seems more readable than ever, it's because it is. All the editorial text has been set with added spacing between lines as well as between columns to give pages improved "instant" eye-appeal and at the same time make them more readable. Page layouts, too, have been modernized, all of which we hope will make American Cinematographer more appealing than ever before to our readers.

Also, beginning with this issue, readers will find more articles dealing with cinematography and film production in other fields, such as industry, science and research. As a feature of this, our 38th Anniversary Issue, we have devoted many pages to subjects relating to these growing fields of film production.

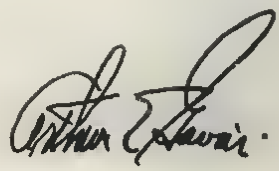
We Move the Clock Ahead

Taking a lesson from daylight saving time, we have moved time ahead and advanced the date of our regular November issue to December in order to better meet the requirements of our expanding foreign and newsstand circulation.

We are not skipping an issue. Subscribers will receive 12 issues of American Cinematographer during 1958—the final issue which will be dated January, 1959—and all existing subscriptions, whether for one, two or three years, will be filled with the required number of issues.

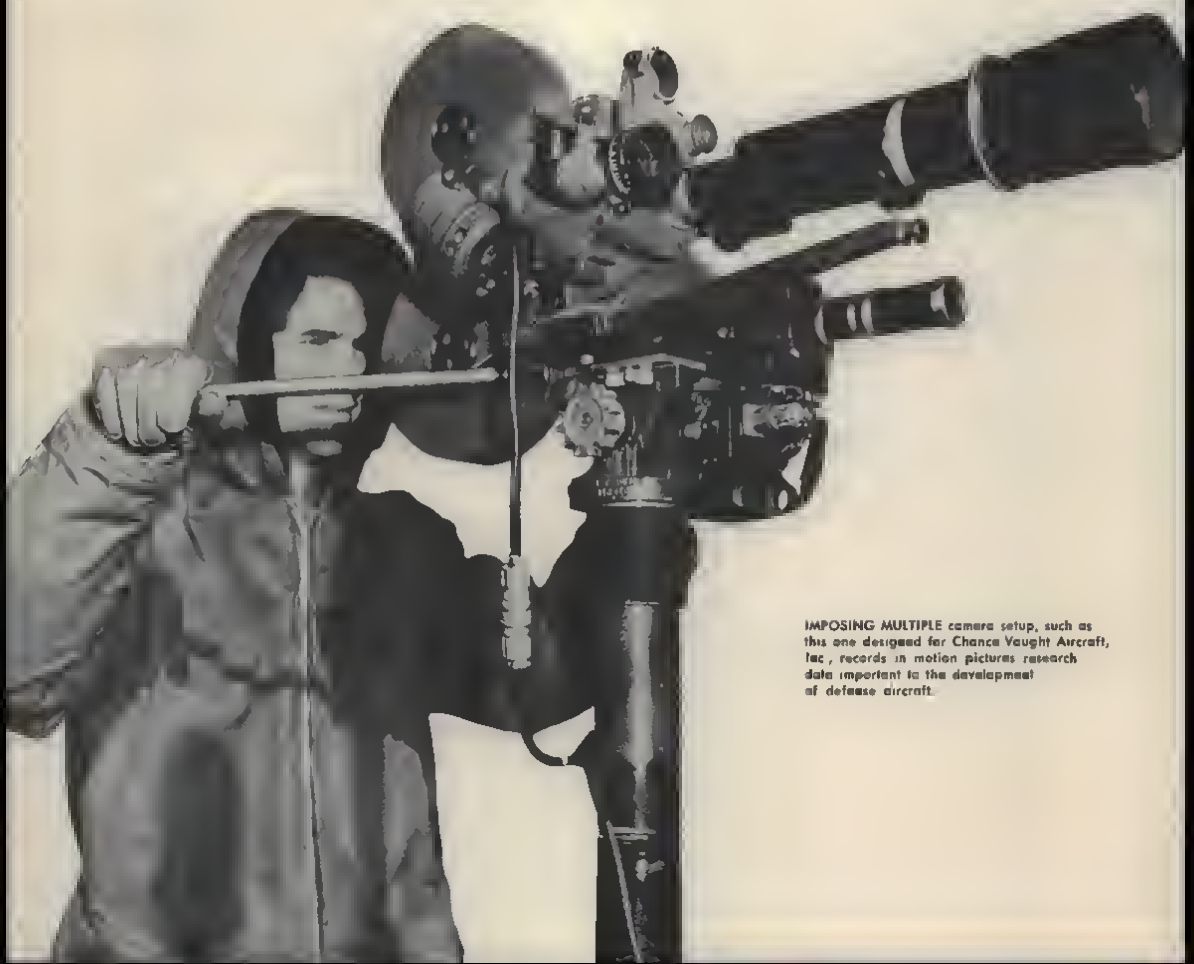
Our 38th Anniversary

With this issue of American Cinematographer we celebrate our 38th year of continuous and uninterrupted publication. Beginning as a four-page tabloid devoted to news of personalities and activities of the American Society of Cinematographers, the magazine has progressed steadily, improving in both quality and volume of its editorial content, in the number of and amount of space occupied by advertisements, and in circulation. We are genuinely proud of all these achievements which have made American Cinematographer magazine the outstanding publication of its kind.



TOMORROW'S PHOTOGRAPHIC

Yau're a cameraman—callege cinema graduate ar prafessianal—and yau ore wandering what the future holds far yau. Yau may find the answer in this analysis of apportunities—tamarraw's and todoy's.



IMPOSING MULTIPLE camera setup, such as this one designed for Chance Vaught Aircraft, Inc., records in motion pictures research data important to the development of defense aircraft.

ASSIGNMENTS

UNDERWATER cinematography, until recently used mainly for thrill scenes for theatrical films, is finding more and more applications in the fields of science and research

WHEN THE FIRST IMPACT of television cut theatre attendance and consequently the number of pictures produced for that medium, there were many who foresaw the end of the Hollywood motion picture industry. But TV merely reshuffled things in Hollywood and those who had been making feature films were now busier than ever making films for television. More recently another hugahoo clouded the future of Hollywood's film makers and for awhile it seemed that the introduction of video tape was the fatal blow that was to kill Hollywood film making.

Most apprehensive, perhaps, have been Hollywood's cinematographers, their assistants and operative cameramen, most of whom have worked behind studio cameras 25 years or more.

But while feature film production has been curtailed, due as much as anything else to elimination of the old and often profitless "B" pictures, most veteran cinematographers today are employed pretty regularly, either on feature films or shooting TV films and commercials.

In the meantime, cinematography, which gave birth to entertainment movies, has found many new and important fields to serve, and today there is as much if not more negative shot daily by those making non-theatrical films than is consumed on major studio sound stages.

A great deal of this new-era film making can be credited to the advent, only 30 years ago, of the 16mm home movie camera. Many who acquired these cine cameras were thrilled at the sight of their film creations on the family home movie screen and began to think about motion picture photography as a career. Many of today's in-plant motion picture units had their beginning when some ambitious employee with a 16mm camera produced on his own a color film about his employer's plant or product. Today, more 16mm cameras are shooting industrial films for research, employee training and public relaitons than had been turned out by camera manufacturers up to advent of World War II.

Today, the use of motion pictures in industry—especially defense industry—has been greatly accelerated. There is hardly an aircraft or missiles manufacturer that does not utilize motion picture photography in some phase of its research, testing or production operations. Add to this the growing number of companies engaged in non-defense manufacturing—such as automobile, metals and chemical manufacturers—that regularly use the motion picture camera as an adjunct to production, and the importance of trained motion picture photographers in tomorrow's scheme of things becomes readily apparent. Motion picture photography has come pretty far since the days it was employed solely for making entertainment movies for nickleodeons.

Amateurs, no matter how ambitious or creative, are not the ones filling industry's requirements for motion picture cameramen. The demand is for experienced men with considerable practical training. A great many cinematographers now working behind cameras in major industry film units are former Signal Corps photographers or graduates of college cinema courses. Lately, there has been some effort by industry to attract cameramen with even more professional experience. Just recently, Lockheed Aircraft's Missiles System Division extended its search for qualified motion picture cameramen to Hollywood—posting an advertisement in a daily industry trade paper in an effort to attract professional cinematographers from the film capital to the comparatively new and exciting field of missiles and rocket testing and research.

The changing fortunes of Hollywood's film industry coupled with the ever-present atmosphere of uncertainty of the future may bring some of the industry's best cameramen to the challenging fields of industrial and in-plant film production. Obviously, there would be some difference in the pay scale, but the new fields offer many other compensations. Already some veterans from the writer, actor and producer professions of Hollywood have left theatrical film production and made rewarding connections with industrial film units. (See "Cinematography—Vital Tool In Rocket Motors Production" elsewhere in this issue.—Ed.).

The importance of non-theatrical motion pictures in the

Continued on Page 704

AUTOMATIC ELECTRONIC FOCUSING

New development brings closer the day of complete automation for technical and industrial cinematography

IT WAS INEVITABLE THAT automatic electronic focusing would follow the development of automatic exposure control, for both of these technical advances, working together, could greatly expand the flexibility and accuracy of cinematography in specialized fields.

Automatic *exposure* control has been successfully applied in a wide area of photographic undertaking, ranging from rockets and missiles development down to the popular hobby of amateur movie making.

Automatic *focusing* control is a comparatively recent development that promises equally-important advances especially in scientific, military and technical uses of the motion picture camera, according to Comapco, Inc., Encino, California, whose development is known as OAR—Optical Automatic Ranging.

According to Howard M. Greene, Comapco's Research Director, and his co-inventor Homer A. Engle, the OAR system is the first simple, rugged, continuously-operating electronic automatic focusing system suited for use with motion picture, television or still cameras, and also capable of accurate range-finding.

OAR is built around a rapidly-oscillated "sensor" composed of a linked group of photo-electric cells. These monitor light energies as distributed within the focal area of a system of lenses or mirrors (Fig. 1). Minute changes in the focal situation will produce definite alterations in both frequency and phase characteristics of the electric currents "reported" by the sensor device. These alterations give rise to commands that regulate servo-mechanisms to produce required changes in lens or mirror position, or make other adjustments.

The servo system, in any case, restores the normal situation in which the mid-point of sensor oscillation falls on the plane of sharpest image definition (focal plane). Thus any change in distance from lens to object, observed at the center of its field, causes a corresponding re-setting of focus, and as a result, the distance of the observed object can be ascertained with close accuracy from a pre-calibrated lens or mirror system. Distance determination within 2% of true value has been indicated by preliminary tests of OAR laboratory models, according to Greene.

Focusing and ranging accuracy of OAR increases with the use of lenses of larger focal lengths and apertures, or with the use of light of shorter wave-lengths such as ultra-violet.

The OAR system is suited also to automatic determination of focal length,

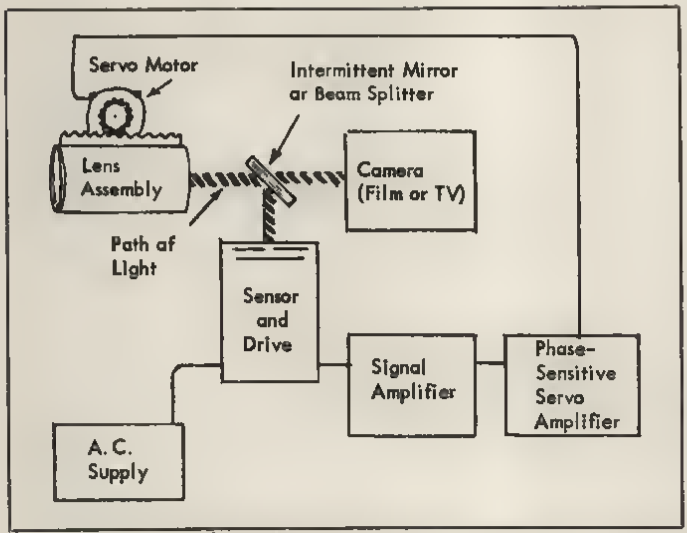


FIG. 1—The OAR system for providing automatic focusing for motion picture or television camera lenses. Where the motion picture camera features through-the-lens viewing, as with the Arriflex and Cameretta, the camera's mirrored shutter can provide the required light diversion otherwise supplied by the intermittent mirror or beam splitter.

OPERATION of prototype OAR unit is explained to Thomas J. Frazier (left), President of Camapco, Inc., by company's Research Director Howard M. Greene. Arrangement of components is shown in Fig. 1

color characteristics, and optical symmetry of lenses or lens systems with magnification of less than unity, according to its developers. It can thus serve as an automatic optical bench of advanced characteristics.

The basic OAR system unites five features:

First, a suitable focusing device, either a refractive lens or a reflective mirror system (see Fig. 1), which has a magnification of less than unity, and forms a "real optical image" of any illuminated object placed in front of it.

Second, within the focal area of such optical image, the OAR oscillating "sensor." This is a sensitive photoelectric cell system in continuous motion back and forth along the optical axis, within a predetermined range. The sensor's varying output of electrical energy corresponds to the varying intensity of radiant energy which it encounters at each point of its constant back and forth travels.

Third, a signal amplifier which multiplies the varying electrical information from the sensor and passes it along to, *fourth*, a servo-amplifier which converts the information into electrical instructions to be followed by, *fifth*, a servo-motor. This motor thus operates to move the lens or mirror system until the plane on which is focused the image of the object being "sighted" lies precisely at the mid-point of the sensor's oscillations to and fro.

Possibly the outstanding achievement of the inventors of this OAR system is their realization that when the plane of image focus coincides with the mid-point of sensor oscillation, the sensor will emit a fluctuating electrical signal whose frequency is *twice* that of its rate of oscillation—and further that as the plane of image focus shifts away from this mid-point, the frequency of the sensor's signal diminishes until it reaches the rate of sensor oscillation—and finally that when the plane of image focus lies between lens and mid-point, the sensor emits a signal opposite in phase to that which it emits when the mid-point lies between lens and plane of image focus.

This dependable and predictable alteration in signal frequencies and phase relationship provides the signal which directs the relatively simple,

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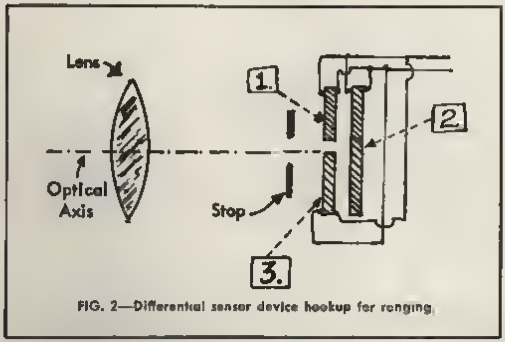


FIG. 2—Differential sensor device hookup for ranging

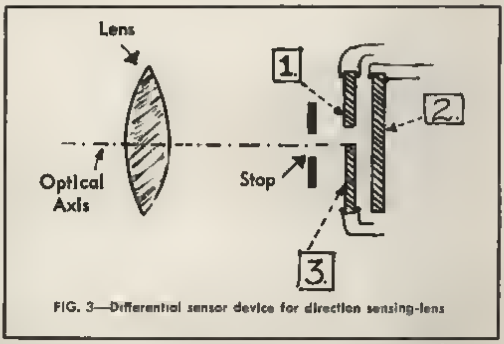


FIG. 3—Differential sensor device for direction sensing-lens

COMPONENTS 1, 2, and 3 in above diagrams are selenium cells of OAR's sensor and drive which receive and react to light rays from lens. Utilization of device for either ranging or focusing is matter of changing electrical hookup between cells, as shown. Focusing and ranging accuracy increases with use of lenses of longer focus, wider apertures, or using light of short wave-lengths.

. . . vital too

DEVELOPING, TESTING and manufacturing rocket motors requires the combined talents of a vast multitude of sciences and professions Often the demands are so great that shortages exist for qualified personnel to staff the countless engineering, designing, technical, mechanical, photographic, ad infinitum groups of this fabulous industry.

In the day-to-day activities of these groups motion pictures play an extremely important role. Often motion pictures are so essential in rocket development and testing and production programs that film requirements are written into contracts let out by the military services. Because of this, many

AEROJET-GENERAL cameramen Fred Johnston (left) and Bill Reilly get ready to shoot a test firing of a "Titan" ICBM rocket engine

BRIEFING cameramen and directors on an upcoming shot in Aerojet's liquid rocket testing area in Sacramento is Rim unit head Fred Gierman, center.

ONE OF AEROJET GENERAL'S rocket engine testing complexes at Sacramento. Engines are tested in formidable towers in background

CINEMATOGRAPHY

n rocket motors production

By JOSEPH J. LIPPER

leading concerns have come to realize the value of functional visualization through motion pictures and have established their own cinema groups.

Aerojet-General, one of the pioneer industries of the space age, has aptly been called "The General Motors of U. S. Rocketry," for Aerojet supplies the propulsion package needed to lift the payload of many major missiles of the Armed Forces.

The company's main facilities are located in Azusa and Sacramento, California. In Azusa there are over 5,000 employees, while almost twice as many are employed at Aerojet's Sacramento Plants.

A roll call of the rocket power plants being developed or produced at Aerojet includes many of America's most important missiles. The company has at Sacramento a Liquid Plant and a Solid Rocket Plant, each employing over 4,500 persons. Principal projects in the Liquid Plant are the Air Force "Titan" Intercontinental Ballistic Missile, boosters for the "Bomare" Guided Missile and work on many advanced liquid fueled propulsion systems. The Solid Rocket Plant numbers among its projects, rocket motors for the Navy "Polaris" Fleet Ballistic Missile (the 1,500 mile range weapon designed to be launched from a submarine), the Air Force's revolutionary solid fuel "Minuteman" Intercontinental Ballistic Missile, boosters for the Navy's "Regulus" I and II Guided Missiles, rocket power for the Army's swift and lethal "Hawk" Missile and many others. In addition, Aerojet is participating in the "Dyna-soar" Program, the Air Force's dramatic man-carrying space ship program.

Commensurate with the over-all growth of Aerojet-General is the growth in size and importance of its Photographic Department. In Sacramento there are two photography units, one for the Solid Rocket Plant and one for the Liquid Rocket Plant, both operating as separate and unique entities.

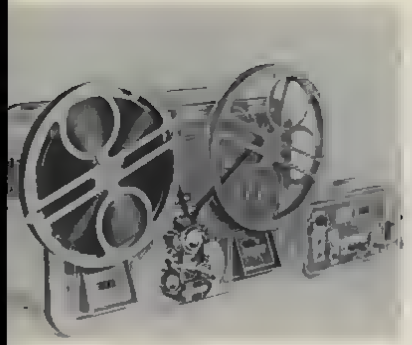
The production and application of motion pictures in the rocket industry differs widely from that usually associated with theatrical or even industrial film production. Here, sex appeal radiates from metal chambers and glamour glitters in highlights from polished instruments. Drama is reflected in the intent faces and in the strained atmosphere of the count down.

The peculiar problems inherent in the job of photographing the missile industry are many and complex.

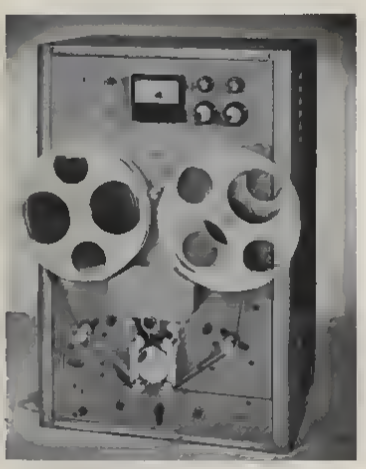
Continued on Page 710

A 16MM Arriflex and a 16mm Mitchell are used by Aerojet's film unit for recording scenes in one of many complex control rooms of the Solid Rocket Plant for static test firings.

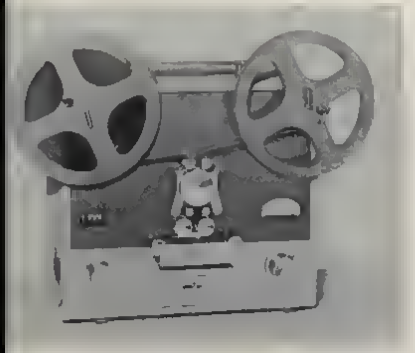
GIERMAN, at desk, briefs his crew on lining up office scene for documentary production, while cameraman Johnston lines up the Arriflex camera with assistance of B. Sipe and T. Perkins holding slate.



Magnasync "Mark IX" Portable



Siscil-Hoffman Automatic S-7



Hollen Transistorized Portable

PICTURED ABOVE are three popular and very efficient 16mm magnetic film recorders widely used by industrial and other independent film producers for recording sound for 16mm productions.

DO-IT-YOURSELF SOUND RECORDING

PART 2

Magnetic recorders make it easy for the small film producer to record his own sound tracks. Here are tips on selecting the right magnetic recorder.

By ALLEN JACOBS
The Calvin Co., Inc. Kansas City, Mo.

DURING THE PAST ten years, the techniques and equipment for recording sound for industrial and technical motion pictures has undergone a revolution. Earlier, recording sound by photographic (optical) means not only involved costly equipment but also called for specialized techniques and considerable skill. The same situation prevailed in the use of discs. Back in the 40's, most of the sound supplied by our clients for transferring to their films was on discs; little of it was as yet supplied on film.

Today, all this happily is only a memory. No longer do we go through the process of recording sound directly on the 16mm film at playback density, then wait anywhere from a day to a week to get it processed before we can appraise it. This method had its disadvantages in that you couldn't check what you recorded until long after you had finished shooting, and then considerable quality was lost when various sound tracks were added and recorded to the printing density track. In rerecording from film to film, no matter how good the playback track was, it wasn't as good as the original quality, and then it suffered further loss when it was rerecorded.

Now that we are able to record sound on magnetic tape or film, it's possible to record a narrative or synchronous sound scene—and then listen to it immediately to make sure that the sound take is acceptable. And it's also possible to mix your printing sound track from the edited magnetic materials, with the final quality so close to the original that only a highly-trained sound man can detect the difference.

We speak of recording with magnetic materials. Let's examine the nature of the electronic and magnetic recording phenomena. Let's assume that we are to record a 1005 cycle tone, using either coated film or coated tape, operating the magnetic recorder at 15" per second. Then, let's assume that with scissors we cut out a piece one-inch long. On that one-inch long piece of film or tape there will be 67 narrow bands or magnetic domains. If the tone we recorded was a loud one, the bands will be magnetically strong. If the tone recorded was weak, the bands will be magnetically weak. But, weak or strong, there will still be 67 bands per inch.

Now, if we record at the slower speed of 7½" per second, instead of 15 ips, there will be twice as many bands in a given inch of recording tape (or film). Instead of 67, there will be 134 crowded into the same lineal space.

Continued on Page 720

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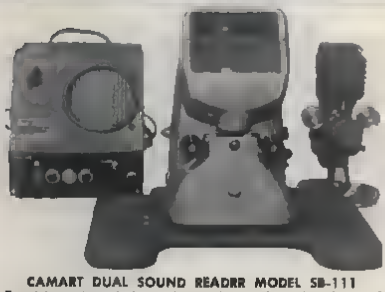

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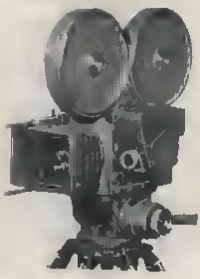

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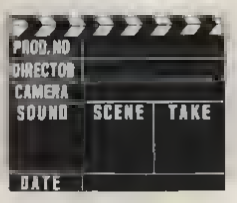

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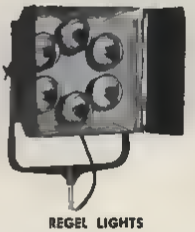

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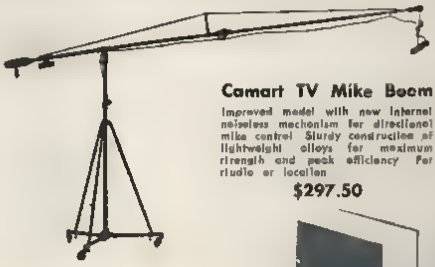

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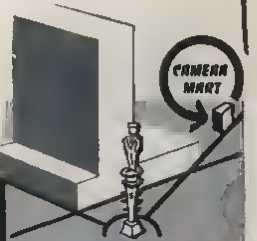

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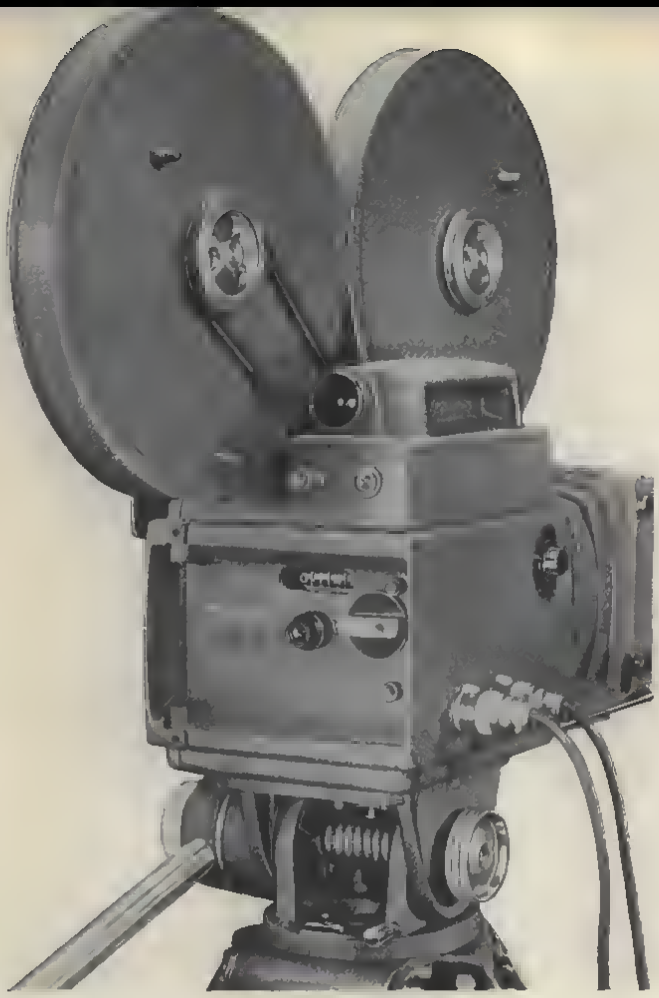

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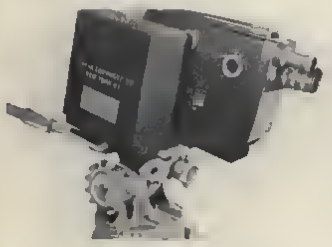

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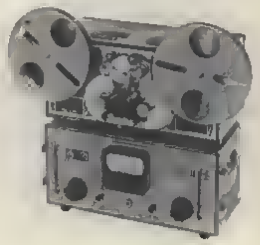

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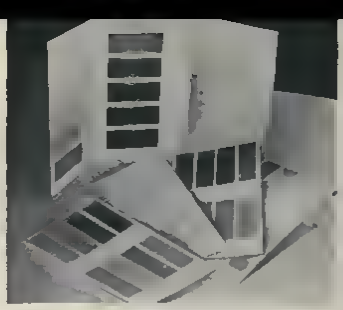

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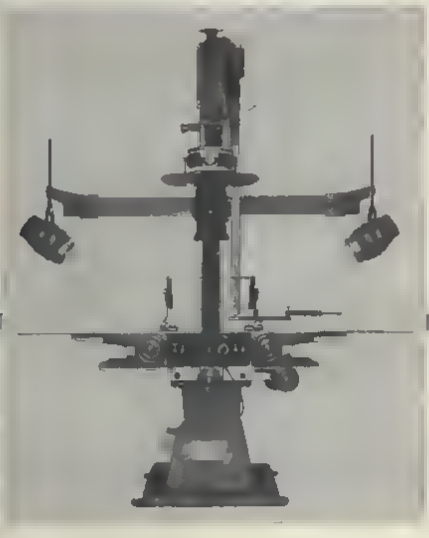

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Animated

AFTER THE animator's rough pencil drawings are approved by the director, they are carefully traced onto cels with ink

IN THE CLOSING paragraphs of Chapter 4 of this series, which appeared here last month, the term "cel level" was explained as the relative position on the animation stand occupied by one or more celluloid or acetate sheets on which the action images are drawn and inked. Usually there are four: the cel on the bottom, next to the background, is the first level; the one on top, the fourth.

It is a function of the animator to break down the various actions in a given scene and consign each to a definite cel level. Action that remains in the background or that works under other action is put on a lower cel level, the reverse holds for action that works in front of characters. Action can move from one cel level to another, but this isn't advisable unless absolutely necessary because of the slight jump in color tone that usually results when changing the number of cels above an illustration, as explained last month.

Whenever there is some non-moving prop in the foreground—a tree, rock, stump, bush, etc.—behind which the action of the scene works at some time, it is placed on the top cel level and termed an "overlay." The prop, portion of the terrain, or whatever it might be, is painted in the same fashion tones and colors as the background, either in oils directly on the cel, or on regular water-color paper—then cut out and cemented onto the cel. The purpose of an overlay is to increase the pictorial effectiveness of a scene by providing it with a feeling of depth and third dimension. It can also help "frame" a scene to enhance pictorial composition. This technique was lavishly used in such Disney productions as "Snow White and The Seven Dwarfs" and "Bambi," and in the more recent full-length animation feature "Sleeping Beauty," to be released by Walt Disney early in 1959.

Animator Draws Only Key Poses

Usually the animator is not required to create every drawing that makes up a complete sequence of action. Only in certain instances does he even go so far as to make every other drawing, and rarely, if ever, does he make a finished drawing. There is good reason for this: to do so would slow him down unnecessarily and consequently cause him to lose some of the spontaneity that's a vital part of animation.

As a rule, the animator will draw only the key poses or "extremes" of the action, and leave the supplementary poses or "in-betweens" to an assistant, known as an "inbetweener." The "extremes" represent the salient spots in the course of an action where a definite change in the position or expression of a character takes place. "Extremes" can be many frames or just one or two frames apart, depending on the type of action.

Some representative examples of an animator's rough "extremes" were illustrated on page 627 last month. Ranging from drawings 49 to 76, the series comprised exactly one foot and 12 frames of film, or what eventually required 17 separate and complete drawings after the roughs were

Film Techniques

PART V

After the animatar draws the key poses af the actian, the supplementary fill-in drawings are executed by an assistant knawn as "in-betweener."

inbetweened and cleaned up. It should be noted that while only 17 drawings were required to portray the action, a new drawing is not always required for every frame of film. Most action can successfully be handled in a procedure known as "2s"—that is, by exposing each drawing to two frames of film instead of one. Where the action is very fast, then the drawings are shot on "1s"—that is one frame to each drawing, which steps up the action pace on the screen. In fast action, there is a greater gap in the movement cycle as represented by each drawing than where slow action is illustrated; thus if the fast action drawings are shot on "2s," a slight jerkiness will be apparent in the screened action. So, by making an additional drawing, or inbetween, the action is smoothed out. An example of this is the action of Bambi jumping. The first part—of Bambi anticipating the jump— was shot on "2s", and the last part—where the action is stepped-up—was exposed one-frame to a drawing.

The reader's attention is again called to drawings 49 to 76 illustrated on page 627 of the October issue. These represent the animator's rough extremes of the important poses in the course of Bambi's jumping action. The drawings that were subsequently made for insertion in between these roughs illustrate the supplementary positions leading from one extreme to the next. When turning the rough extremes over to the inbetweener, the animator also provides an exposure sheet properly marked to show how he wants the extremes timed—i.e., how many frames apart they are to be shot. The inbetweener then spots his rough inbetweens in correct relation to the pattern of the animator's extremes.

When all of the rough drawings for a scene are completed, the animator sends them to the Test Camera Department where they are shot in animation photography in their respective order for a *first rough test*.

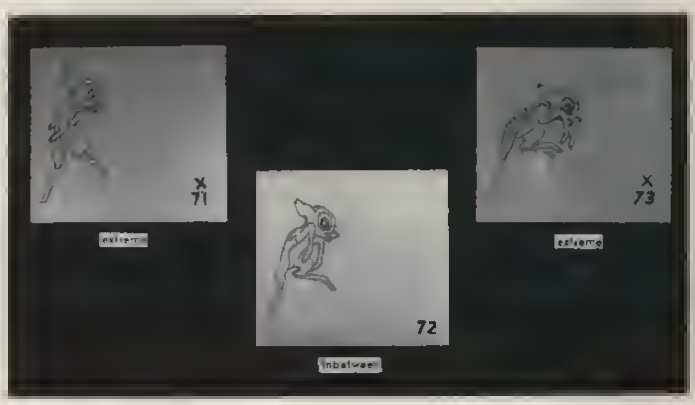
Even though there is very little guesswork, if any, involved in animation today, the animator cannot be entirely sure how his animation will move on the screen until this first rough test is filmed and screened.

Animation Pre-filmed and Screened

In most cases, such tests are shot on negative and the negative used for screening. This results in all lines showing in white against a black background. There are good reasons for doing it this way. For one, the action can be studied quiet as well as where a positive print of the film is screened, and thus a great deal of time and money is saved. Another reason is that the white lines on dark backgrounds are easier on the eyes than where the image is in reverse, with the white screen reflecting an uncommon amount of white light—especially where such viewing is conducted for long periods of time.

The animation tests are subsequently cut into test reels, in sync with the sound effects and dialog tracks. During projection, the reels are projected at varying speeds, forward and reverse, to afford minute study of the action—much the same as is possible where a table-viewer is used. All of the elements that go into the picture are checked in this fashion and changes and improvements decided and outlined. At this time, any necessary changes in the timing of the action are decided; scenes are shortened or lengthened, a new

Continued on Page 714



THE ANIMATOR draws only the key poses or "extremes" in a sequence of action. Later, another artist known as an "in-betweener" draws the necessary poses that go in between the extremes to round out the action.

IN THE PAST year, the two television networks which do their own news film coverage have been shifting their sound-on-film shooting from optical/photographic to single-system magnetic, using pre-striped negative in the cameras. Both NBC and CBS are expanding their use of magnetic striped film and indications are that the practice will eventually become universal. CBS News recently compiled a comprehensive report on the network's experiences with magnetic sound film, which subsequently was condensed and published in the October, 1958, issue of National Press Photographer, monthly journal of the National Press Photographers' Association. We are indebted to the NPPA for its kind permission to reprint its condensation of the CBS report herewith. We think it will be informative and helpful to our many television-cameramen readers.—ED.

SINGLE-SYSTEM MAGNETIC SOUND

. . . new trend in TV news film photography

A FILM STORY FOR a television news program must be available within the shortest possible time or its value is lost. Time in television news production is measured in minutes and it is not uncommon to have film material processed and edited for "air" use in less than an hour. News events occur at any time and in any place; time available for equipment set-up is limited; lighting is restricted, if available at all, acoustics of a given location are fixed and no corrections can be made.

The time limitations together with the required portability of equipment have determined the general choice of 16mm film for television news production. These same factors have determined the choice of single-system rather than double-system sound. Having selected the best available means of working within the time requirements and employing all available methods of shortening laboratory processing and film editing operations, it is possible to produce a film product within an acceptable time limit.

Television news, unlike its theatrical counterpart, is not a complete film package within itself. Instead, it is continually subjected to direct comparison with "live" programming or with a film product produced under the best possible conditions. Considering that an average network television news program is viewed by people who are accustomed to the high quality sound of radio news, the quality of sound-on-film becomes an important consideration.

Sixteen millimeter single-system photographic sound is, at best, just about acceptable. The required use of a film product not designed for sound recording and the compromise between sound and picture quality in processing limits the maximum standard of achievable sound quality. These limitations have long been recognized. The advantages of magnetic sound in extended high frequency response, marked improvement in signal-to-noise ratio and lower harmonic distortion are also well known. An equal or even more important advantage is the ability to monitor magnetic sound as it is produced thereby insuring the presence of the sound record.

Raw Stock Film Striping

For these reasons, CBS News began an engineering program in 1955 to evaluate the problems in the use of pre-striped magnetic sound for 16mm television news and documentary film production. By "pre-striping" is meant the application of the magnetic material to the film prior to exposure and development. In recent months this magnetic sound procedure has been employed for some of these types of production at CBS. Our engineering program included the evaluation of problems in such phases as striped magnetic sound production as raw stock film striping, camera photography, laboratory processing, editing, film cleaning, projection, printing and raw stock and library storage.

Magnetic striping of developed photographic film has been commercially available for more than five years. The SMPTE Standard relating to the position of the 100-mil coating was approved in 1953. In order to utilize pre-striped magnetic sound, it is necessary to adapt the striping technique to operate in photographic safe light illumination or in "total darkness." In general, all photographic materials can be striped providing the applicating equipment is designed for operation under the required dark room conditions. The potential problem in the utilization of pre-striped film is not found in the striping application but rather in the processing.

Pre-striped Camera Film Used

Both the laminated and wet types of pre-striped magnetic material have been used in our operation with satisfactory results. Contrast, speed sensitivity and fog susceptibility have not been affected. There is no evidence of rubs, abrasions, sensitized or desensitized defects, dirt or scratches. Quality of the magnetic stripe has been successfully controlled by the manufacturer.

In addition to pre-striping of negative raw stock film on the base side, a negative-positive operation where contact printing is used requires pre-striping of the positive raw stock film on the emulsion side. In this way, either the negative or a contact print from the negative can be re-

Continued on Page 716

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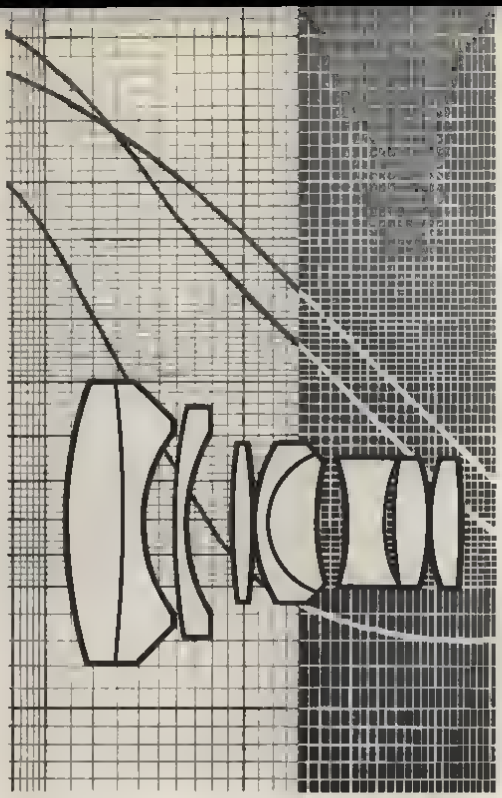

NEW LENSES FOR THE 16MM PROFESSIONAL

Nine new Taylor-Habsan lenses promise greater prafessional quality in 16mm cinematography

By FREDERICK FOSTER

OF SIGNIFICANT IMPORTANCE to those using 16mm cameras for professional work is announcement, by the old and long respected British optical firm of Taylor, Taylor & Hobson, Ltd., of a new series of lenses for 16mm professional motion picture photography. The new Kinetals, which is the tradename of the new series, are the culmination of critical and exhaustive investigation in which experience and imaginative research, coupled with the extensive use of rare earth glasses have predominated.

In recent years, the use of 16mm films for professional productions has increased, and of the several contributory factors, the advent of high-precision and lightweight 16mm motion picture cameras is very significant. The relative costs of filming in 16mm as opposed to standard 35mm are quite impressive, and a comparison of these may be made on the basis of footage per unit time—which is on the order of 1-to-2.5, a considerable saving in expenditure. In television film and newsreel production, these factors suffice to dictate policy and it is surprising that 16mm has not presented an even greater challenge to the generally-considered "standard" of 35mm.

The answer lies, of course, in the recorded image—or perhaps we should say in the screened result. The cumulative effects of inferior definition and grain in high-speed emulsions become increasingly apparent when comparison of 16mm shots with those of 35mm is made in projection.

Survey Preceded Designing

Recent advances achieved in 16mm emulsions by film raw stock manufacturers, and the recognition by film laboratories of the stringent requirements of 16mm film processing, coupled with professional motion picture equipment and a range of lenses specifically designed with high corrections, relatively high apertures, and providing uniform illumination over the whole of the 16mm frame area, enables more and more production units today to utilize the advantages of 16mm film, while obtaining quality comparable with that usually associated with the larger format.

Recognizing these trends, Taylor-Hobson lens design engineers directed their efforts into the study of the ideal specifications for a range of professional 16mm lenses. In the beginning a survey was made among professional cinematographers engaged in both the 35mm and 16mm fields of film production, and this indicated that for 16mm photography, the angle of view of each lens should be essentially the same as that for 35mm photography. Equally important, in the consideration of focal length, was the choice of aperture and the ability to mount a number of lenses on multi-lens turrets with little or no lens-to-lens interference. The result was a series of nine Kinetal lenses for 16mm cameras, ranging in focal length from 9mm to 150mm (See Fig. 2).

"Our survey showed that the adoption of ae aperture of the order on f/2 would meet current and foreseeable requirements, bearing in mind that the future would undoubtedly produce faster color emulsions," a T-T-H engineer explained.

In view of the increasing use of color film, it was decided to standardize on T-stops, and T-T-H lenses of the Kinetal series in the wide- to mid-angle range have been designed to provide a full aperture of T/2. The use of T-stop calibration was introduced by Taylor-Hobson in 1948, and in

Continued on Page 700

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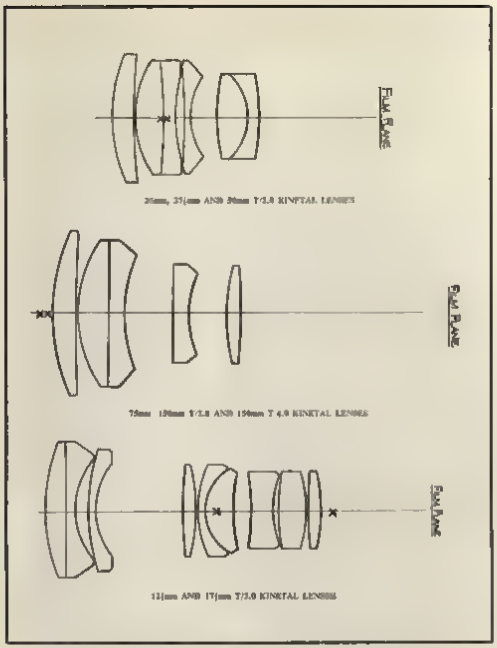

FIG 1—Element diagrams of Kinetal lenses.

the past ten years this has become an established requirement of most professional 35mm motion picture cameramen. Because T-stop lenses all transmit the same amount of light at any given stop, they are important to achieving color photography of the highest quality.

Also following from the use of color film stocks, it is obvious that a new range of lenses must restrict vignetting to an absolute minimum in order to give uniformity of exposure over the whole frame. In the past, the latitude of black-and-white stock has enabled the lens designer to take full advantage of the truism "Where there is no light, there is no aberration," and obtain an adequate oblique ray correction at the expense of uniformity of exposure. The needs of the amateur cine photographer were paramount then, resulting in light-weight cameras of minimum bulk and small turret pitch, which placed severe restrictions on the lens designer. In many cases, therefore, due to the limited envelope of the lenses, mechanical vignetting was unavoidable.

In the design of the new range of Kinetal lenses, the Taylor-Hobson design staff has taken advantage of the relief from such restrictions which modern professional cameras afford and thereby have been able to achieve a new high degree of both optical and mechanical freedom from vignetting throughout the range. This feature is best observed from the uniformity of exposure over the whole of the film frame—especially where the film is in color.

The new Kinetal lenses for 16mm professional use are or will be available as unmounted optical units, in mounts for Arriflex 16mm cameras, and in International Type-C mounts.

The 9mm T/2.0 Kinetal lens covers an extremely wide angular field of almost 70° (and has an approximate aperture of f/1.85), yielding a transmission aperture of T/2.0. It represents the latest achievement in wide-angle lens design, and because of current patent proceedings, it is not possible to disclose the construction. It is of the inverted telephoto type of construction, with seven components comprising nine elements. With a lens of such short focal length, depth of field considerations are not so critical and the wide relative aperture can be more useful than with any lens of longer focal length, particularly under conditions of severe space restrictions and low lighting levels. This lens will not be available until 1959.

The 12½mm and the 17½mm lenses offer the professional cameraman useful viewing angles in the short focus end of the range. Both lenses employ the now well-established Taylor Hobson inverted telephoto construction, of whose image quality 35mm professional cameramen are well aware from the use of the 18mm and 25mm Cooke Speed Panchro Series II lenses. Each lens is individually corrected for its particular angular field and both represent a degree of quality hitherto unknown in wide-angle 16mm photography. The nine element, seven component construction (Fig. 1), is sufficiently complex to afford an almost complete correction of all the aberrations. Both lenses are virtually free from vignetting, thus allowing uniform exposure across the whole of the 16mm picture area.

Field Curvature Absent

The 25mm, 37.5mm and 50mm Kinetal lenses are of six-element, four-component construction (Fig. 1), employing all the advantages of the newer glass materials, together with improvements in design knowledge. All three lenses are corrected for their individual angular field, giving crispness of definition over the whole field. The absence of field curvature, together with encouraging vignetting characteristics, should provide a uniform exposure over the whole of the picture area.

The scaling-up of the traditional medium focus lens produces a lens of considerable bulk situated a long way from the focal plane of the camera and apart from causing obstruction to other lenses that may be mounted on the turret it also leads to a certain amount of instability. Yet to achieve the standard of performance now demanded in modern film production, it is necessary to have lenses more complex than the conventional Cooke triplet construction.

Continued on Page 724

Focal length	*F No.*	*T No.*	*Construction*
9mm	1.85	2	9(7)
12.5mm	1.8	2	9(7)
17.5mm	1.8	2	9(7)
25mm	1.8	2	6(4)
37.5mm	1.8	2	6(4)
50mm	1.8	2	6(4)
75mm	2.6	2.8	5(4)
100mm	2.6	2.8	5(4)
150mm	3.8	4	5(4)

FIG. 2—The range of Kinetal lenses.

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JOE TANNEY, S O S. President, makes periodic visits to film production centers or to company's west-coast office in Hollywood.

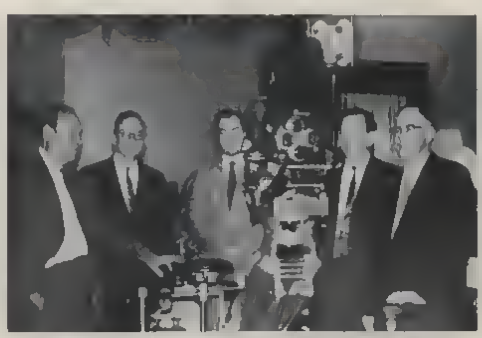
ALTHOUGH S O.S Cinema Supply Corporation has established itself pretty solidly during the third of a century it has catered to the needs of film makers, two of the company's recent accomplishments contributed additionally to its prestige and customer relations. Anything a merchandiser can do these days to make it easy for customers to locate a needed item of equipment is certain to result in the proverbial beaten path to his door.

When the company, after arduous months of research, compilation and editing, published its latest equipment catalog, it provided those in the industry with one of the most comprehensive directories of motion picture production equipment ever published in the U S And when, at the recent semi-annual convention of the SMPTE in Detroit, the company assembled one of the largest equipment exhibits in terms of items displayed, it afforded many of those in the business of making and exhibiting motion pictures unique opportunity to see and examine first hand many pieces of equipment which, until then, they had known about only through editorial description or advertisements.

A single desk in 1926 was the starting point of S.O S. Today, the firm occupies an entire building in New York's west side, at 52nd St. and 11th Avenue Located close to Gotham's industrial and documentary film studios, film processing laboratories, big theatre circuits and TV broadcasting systems, S.O.S ranks high on the list of "places to visit" for cameramen and other film production personnel visiting New York City. For producers who find the West Coast more convenient, a branch in Hollywood was established in 1955 to serve S.O.S. customers in the 11 Western States A completely equipped showroom was located in the heart of the film capital to offer the same prompt, efficient service for which the company has built a reputation in the East

S O S. has been aptly termed "the Department Store of the Motion Picture Industry" Each new issue of its catalog strengthens this claim. In the new 176-page 11th edition, more than 8,000 professional items are described and over 500 illustrations appear Almost every civilized country has contributed to the array of equipment for motion picture and TV production described in the catalog Many new products available for the first time are described. Seventeen information-packed sections cover

Continued on Page 708



S O S held open house recently to preview new Moviola Crab Dolly Among visitors were J Burgi Contner, ASC, (extreme left) and Jack Pill of Moviola (2nd from right)

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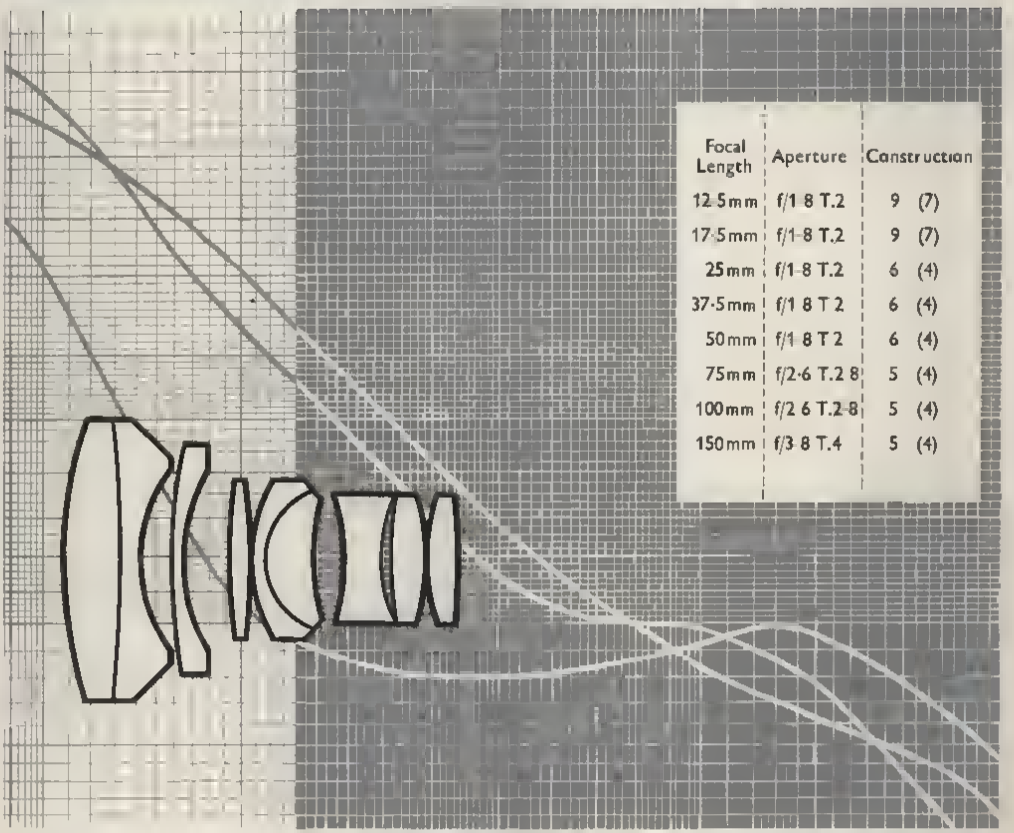
'KINETAL' LENSES

For 16mm Professional Motion Picture Photography



Focal Length	Aperture	Construction
12·5mm	f/1·8 T.2	9 (7)
17·5mm	f/1·8 T.2	9 (7)
25mm	f/1·8 T.2	6 (4)
37·5mm	f/1·8 T·2	6 (4)
50mm	f/1·8 T·2	6 (4)
75mm	f/2·6 T.2·8	5 (4)
100mm	f/2·6 T.2·8	5 (4)
150mm	f/3·8 T.4	5 (4)

1. Eight lenses with 3 types of construction
2. Specifically designed for the requirements of professional 16mm motion picture photography
3. Calibroted in T stops only
4. Available as unmounted lenses for use with Mitchell 16mm motion picture cameras and in Taylor-Hobson designed mounts for 16mm Arriflex cameras. Focusing "C" mounts will be available in the near future.
5. Superb color-correction
6. All focal lengths designed to take fullest advantages of Lanthanum and rare earth glasses

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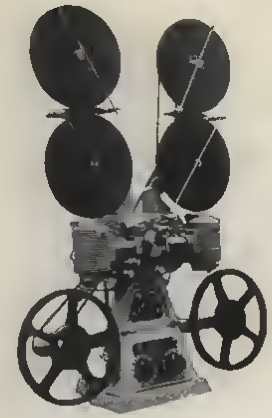

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TOMORROW'S PHOTOGRAPHIC ASSIGNMENTS

Continued From Page 685

future was brought sharply into focus during the recent semi-annual convention of the Society of Motion Picture and Television Engineers in Detroit, when a number of technical papers on a wide range of non-theatrical film subjects were read before audiences of engineers, technicians, and equipment suppliers.

Donald McMaster, Vice-president and General Manager of Eastman Kodak Company, pointed out the many challenging opportunities that lie ahead for using motion picture photography. "New and refined techniques and still newer kinds of equipment will surely add to the value of photography as an industry and research tool," he said. "Some of the technical papers read before this conference demonstrate the considerable progress already made in designing cameras and lenses for tracking satellites and missiles. This work is suggestive of the contributions that are yet to be made in bringing back information from outer space. We may be sure that much of the information about outer space will be obtained by photography. Take man's first exploration of the moon, for example. We may safely predict that rockets in orbit around the moon will be the first successful instruments for relatively close-up study of the moon's surface."

McMaster pictured rockets carrying automatic cameras with telephoto lenses and automatic film processing equipment photographing the moon's surface, then by means of compact television transmitters sending the photographed results back to earth.

Reflecting cinematography's role in still another field was the paper on "Analysis of Growing Business Film Usage" presented before SMPTE conventioneers by John Flory and Thomas W. Pope, also of Eastman Kodak Company. The report revealed the chief areas in which business and industry are making use of company-produced motion pictures. These included selling, advertising, public relations, employee training, and research and development. These applications, the paper pointed out, account for two-thirds of the quarter-billion dollar annual expenditures in the non-theatrical film production field.

The production of films for educational television—a new and promising field for motion picture cameramen—was outlined in a paper presented by David W. Johnson of the University of Southern California. Johnson explained how the techniques of film making for this field differ from those used in commercial TV filming in that they must meet individual situations as they arise, with no sacrifice in quality.

New trends in low-cost in-plant film production was subject of a paper presented by F. A. Denz of the Remington-Rand Division of Sperry-Rand Corporation. He explained how the advent of high-quality, lightweight 16mm cameras and magnetic-optical recorder-projectors, coupled with new and faster film emulsions, provide increased opportunities for business and industry to use low-cost, internally-produced training films. As this trend grows so also will more employment opportunities open up for trained 16mm cinematographers.

Motion picture photography has become an essential tool in science, research and industry. Its contributions have been as important on the missile testing range as in the photomicrograph laboratory. Some of the most absorbing and remunerative opportunities for skilled motion picture cameramen occur in industrial and scientific research where today—just to cite one typical use of specialized motion picture photography—the ultra high speed camera is producing answers to production, assembly and fabrication problems heretofore unassailable.

Aspiring cinematographers who once thought of the Hollywood studios as their only goal, have since discovered other, more opportune fields in which to apply their talents. Among these are:

- Nuclear weapons development
- Missile and rocket motors research
- Test performance of missiles
- Underwater cinematography
- In-plant industrial film production
- Time-lapse photographic studies
- Industrial research photography
- Aerial cinematography
- Property protection cinematography
- Training film production
- Teaching film production
- Biological research

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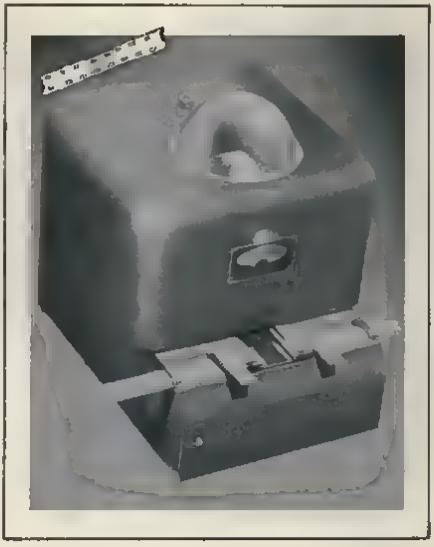

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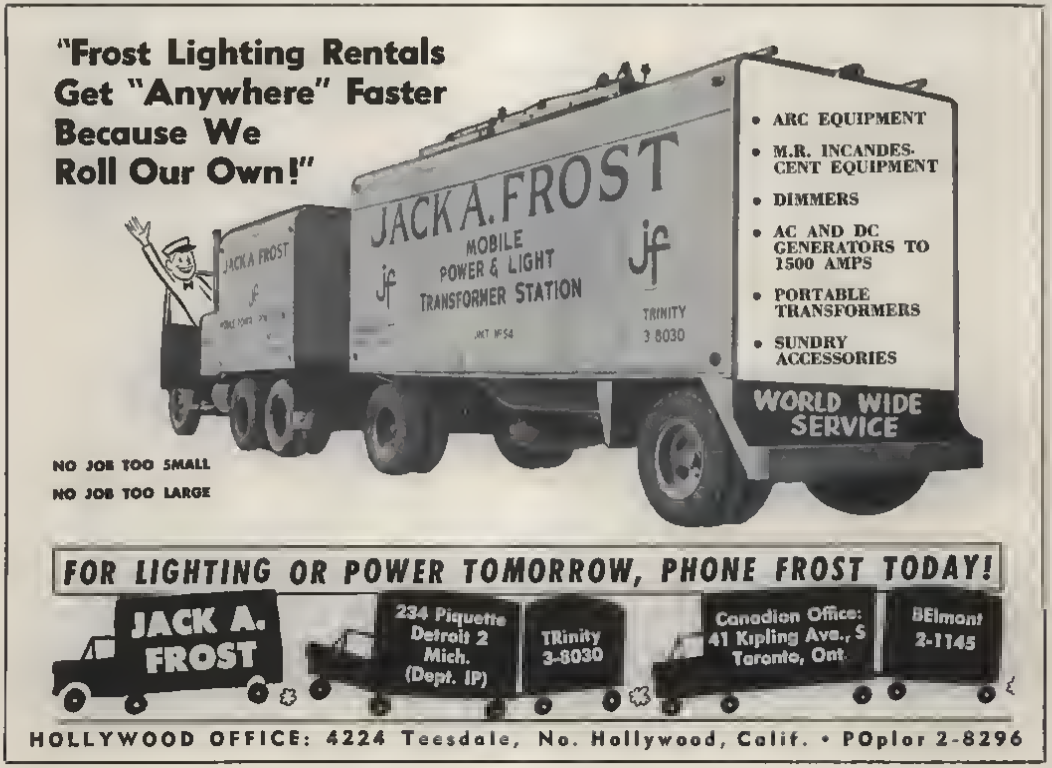
tised for a cameraman, but advertisements for cameramen for non-theatrical motion picture production appear regularly in this and other publications devoted to the film industry.

Some recent requests noted have been for "a 16mm cameraman with experience in sound and editing to work with a college unit"; "an experienced cinematographer capable of assuming responsibility for production of motion pictures to Air Force specifications"; "a radio-TV film specialist to shoot, edit, write and produce"; "experienced industrial writer-directors, cameramen, and editors" for an industrial firm in San Diego; and "a creative, imaginative person to supervise complete in-plant production of engineering and technical films in Ft. Worth, Texas." The various government agencies almost always have openings for motion picture cameramen, which are filled through Civil Service in competitive examinations.

Heretofore, achievement in cinematography has been measured in terms of composition, lighting, mood treatment and other factors relating to the artistic side of photography. But there are other avenues of achievement, known best to the non-theatrical motion picture photographer. Invariably they are more rewarding because they constitute a part of some important technical advancement, and as a result new applications and accomplishments in motion picture photography are being reported with increasing regularity.

Atomics International, a division of North American Aviation, Inc., recently announced that the dislocations, or imperfections in the atomic arrangement of the structure of graphite, an important material used in nuclear reactors, have been recorded for the first time in motion pictures by the company's photographic department. For this undertaking, a 16mm camera was mounted so the lens was near the screen of an electron microscope used in the experiment. A special lens having an aperture of f/0.95 plus use of high-speed negative were major contributions in the photographic film record.

An important factor in the expansion of opportunities for motion picture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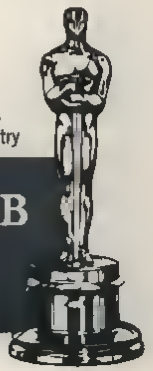

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cameramen is the continuing development of new tools for specialized applications of motion picture photography—such as the airborne drone camera scoring systems produced for U.S. defense by Traid Corporation, Encino, California. When the famed B-17 Flying Fortresses flew their final missions as targets for NIKE ground-to-air guided missiles, Traid 70 high-speed cameras rode the wingtip pods on each plane to record the action. While operation of these cameras required no photographers behind them, experienced cameramen played an important part in the camera's development and installations.

High-speed flight and laboratory tests, which hitherto have been difficult or impossible to view with the human eye, are today providing revealing information through the medium of high-speed cinematography. Operating at speeds ranging from 48 to 100 frames per second, special Mitchell cameras operated by photographers having special training are used by Sandia Corporation at the Atomic Commission's Salton Sea test base for recording weapons test operations.

These are but a few examples of the more advanced applications of motion picture photography today. It is here that the technically-minded photographer is playing a big role, for although the tools for specialized cinematography are readily available, as always the human factor, using these tools, contributes most in the photographic accomplishment. Tomorrow's most rewarding assignments for motion picture photographers, therefore, are likely to be far removed from the sound stages of Hollywood—in industry, science and defense. ■

S.O.S.—SIGN OF SERVICE

Continued From Page 702

16mm/35mm studio and newsreel cameras, lenses and viewfinders; motion picture and TV camera accessories; animation and special effects machines; lighting for studio and video; sound recorders and accessories; preview and TV background projection equipment, editing, cutting room supplies and film handling devices; movie and microfilm printers, processors and laboratory apparatus; camera and recorder motors; technical books and stage scenic materials.

While S.O.S. manufactures some equipment, it handles products of many other manufacturers. Understandably it is most proud of the items sold under the S.O.S. label. Some of these are imported from England, France, Holland, Western Germany, Australia and Japan. Equipment such as the Tel-Anima line of animation equipment, hot press, special effects units, printers and Bridgamatic film processors, have established the company as a prime source of equipment for film producers in all fields. "In this keenly competitive age we must keep a few jumps ahead," says J. A. (Joe) Tanney, S.O.S. president. "In the past two years I've been half way 'round the world looking for new lines so that we can offer the pick of the most modern equipment to the industry."

The roster of S.O.S. imports is imposing — Moy, Gaumont-British-Kalee, Vinten, Setrac, Peterson, HKS, Zeiss, Deltschaft, Miller and Seisaku-Sho, to name a few. To balance these, a thriving export department helps maintain the supremacy of American products in foreign lands. Customers include the Governments of Burma, India, Pakistan, Mexico, Yugoslavia, Indonesia, Cuba, Puerto Rico, Italy, Siam and many others.

Catering to such customers throughout the world, S.O.S. must maintain extremely high standards. Every item sold is accurately checked and carefully inspected under actual operating conditions before being shipped. By rigidly adhering to this strict policy, most problems are solved before they arise. New, used and rebuilt machines are all sold by this firm. It is not unusual to receive orders from around the globe for reconditioned equipment, totaling thousands of dollars, without requesting inspection. "This faith in our reputation is solid, and a result of adjusting claims promptly whenever they arise," says Tanney.

Custom-building of equipment is one of the more important services of S.O.S. Ingenious solutions of many difficult engineering problems — doing things never done before—are everyday happenings at S.O.S. Mechanical, electrical, electronic, optical—no matter what—like the Seabees of World War II, S.O.S. tackles anything. All this is done in a daylight, air conditioned factory manned by craftsmen with many years' experience.

All divisions at S.O.S. are managed by likeable, qualified men. Theatre Supplies are handled by Oscar Lightstone, Vice President, with over thirty years experience in show business; Film Production, Studio and Lab Equipment by Dom J. Capano, Vice President, with 22 years service at S.O.S., the Stockroom by Joe Miranda, with the firm since 1936; Production Supervisor William H. Allen and Repair Shop Foreman Lou D'Allesio, both in the employ of S.O.S. since 1935. Western Representative Alan Macauley was a film producer for ten years. He is ably assisted by Jan Macauley, one of the few full-fledged women members of the SMPTE. Other key employees have been with the firm 15 years or longer.

While emphasis is placed on sales, most major *items* can be rented, and where the use term is extended, a Rental-Purchase plan may be arranged, with a generous allowance for part of rentals paid. In some cases, S.O.S. guarantees lending institutions to re-purchase certain equipment within two years after the original sale. This helps local financing through one's own bank. Another popular "ownership" plan provides for small monthly rent over a three-year period, including a purchase option. Time payments are also available, so *customers are encouraged to own*, rather than rent.

The company's early history began in 1926, with the advent of sound pictures. Little exhibitors couldn't spend thousands for "talkie" equipment, so they had to improvise. Today's craze for Hi-Fi is reminiscent of their mad scramble for turntables, pickups, amplifiers, loudspeakers and similar sound components. Small theatres, in a frantic rush to "wire for sound," made little provision for maintenance. Actually few technicians were available, projectionists were unskilled, and breakdowns of "talkie" machines occurred nightly.

It was then that Joe Tanney formed a group of ex-radio and electrical engineers into a new company called "Service on Sound Corp." Thereafter, exhibitors called "S.O.S." whenever trouble occurred in their sound equipment. Sales of parts and equipment increased, and the company's name was changed to "Sales on Sound Corp." The abbreviation "S.O.S." stuck, and in 1936 the title "S.O.S. Cinema Sup-

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Yvar 100mm 4" f/3.3 tele 4 power magnification Focuses 6' to inf $80.50
Yvar 18mm w.a. f/2.8 Focuses 1 to inf "C" mount. Visifocus $36.50
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SUPER 1200

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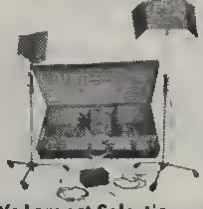

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ply Corp." was adopted, which remains to this day.

Selling sound equipment led to stocking projectors, arc lamps, generators, rectifiers, sound screens, draperies, seating and stage lighting. Shortly afterward floor coverings, automatic ticket machines, coin changers and marquee signs were added to round out a complete line of theatre supplies. S.O.S. became a pioneer in issuing one of the first comprehensive illustrated catalogs embracing everything from boxoffice to back stage.

As years passed, S.O.S. expanded its facilities and outgrew a number of locations. The constant development of new products, plus the steady acquisition of new and different lines, plus enlarging its staff of highly skilled technicians resulted in S.O.S. assuming a leading position in the industry. A subsidiary manufacturing plant was acquired in 1940 to handle defense orders and other war contracts. Throughout World War II, S.O.S. made such defense items as submarine parts, dies for stamping shell casings, gear blanks for gun mounts, armored vehicle and aircraft components. All during the war civilian customer accommodations were continued for theatres to provide uninterrupted service.

Many firms were absorbed, merged or partly liquidated by S.O.S. through the years, firms such as Pacent Reproducer Corp., Royal-Amplitone Corp., Powers Cinephone Corp., Superior Projector Corp., Air Devices Corp., and a number of other organizations. These transitions helped the company bring out many additional products carrying the S.O.S. label.

During and after those war years film and television studio equipment gained greater importance. Government agencies had relied upon S.O.S. for repair and maintenance of 35mm studio and newsreel cameras, printers, processors, etc. "Operation STURELAR" was launched to meet the increasing demand, and in a few years *STU*dio, *RE*cording and *LAB*oratory apparatus became dominant. Gradually professional cameras, recorders and processors were complemented with complete assortments of lenses, studio and video lights, cutting room and film handling devices, and animation equipment. The firm's success in the theatre field was soon matched by its rapidly expanding departments catering to professional motion picture production.

Today, S.O.S. numbers among its important customers such well-known users of motion picture production equipment as Alexander Film Company, National Film Board of Canada, Todd-AO, Bryg TV Color, CBC, CBS, NBC's South Pole "Operation Deepfreeze," Associated Missile Products, Lockheed Missile, Jet Propulsion Lab., Calif. Institute of Technology, Boeing, McDonnell Aircraft, Naval Research Labs., GE Company, Atomic Energy Commission, IBM, United Nations, Redstone Arsenal, Cape Canaveral Missile Center, and many of the major motion picture studios and production units, including Columbia Pictures and Walt Disney Productions. ■

CINEMATOGRAPHY—VITAL TOOL

Continued From Page 689

Among the many difficulties of the job to be performed is the fact that shots are never set up for documentary filming.

Missile industry filming differs from ordinary cine where everything is prepared and the director can "call his shots." In missile industry filming, time does not wait for the camera crew. If a rocket engine is to be filmed and it happens to be in an area difficult to light, nobody will move it into a more advantageous position. Thus it becomes necessary for the director and first cameraman to constantly invent new and untried methods to get the shot, bearing in mind that clarity, composition and sharpness of pictures are still the prime requisites of the work.

Closely allied with this problem is the difficulty in timing. Once the static firing of a rocket engine is begun it becomes obvious the director cannot yell "cut". The activity cannot be repeated, so the first "take" must be a good one or the shot is lost forever with no chance of reshooting.

Perhaps one of the main obstacles found in this field of cinematography is the subject matter itself. Very often a motion picture unit is called upon to film the lifeblood of the missile—the potentially tempermental propellant. Here the photographers must take extra care, for the hot photolamps could easily spell trouble. To counteract this problem only inert propellants are employed where possible when filming such sequences. This is more of a problem in the Solid Rocket Plant than the Liquid Rocket Plant because the fuel mixture in the former is an integral component of the rocket engine all along the production line, while in the latter the liquid fuel is not injected into the engine until shortly before count-down time.

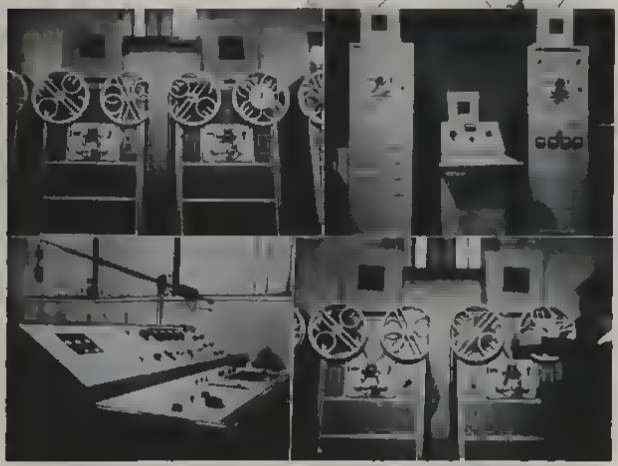
Another wide disparity between the production techniques for industrial films at Aerojet and the usual theatrical motion picture techniques is that sometimes it is impossible to first write the script and then shoot the scenes. In the production of a quarterly film report to the military service involved, which is one of the motion picture section's major contractual obligations, it is necessary to accumulate script data about events which are occurring progressively over the three-month period, often right to the final day of the period. At the same time, it is essential to do the camera work on each event as it happens. Since important

Out Of The Book

AN ITEM OF EXPENSE

"THE GREAT EXPENSE of motion picture production often comes as a shock to business executives who know something about cameras through their interest in amateur photography. They do not stop to consider that a professional cameraman must create a smooth-flowing film from a prescribed pattern. He must be master of the conditions that he faces. The amateur, on the other hand, is usually an opportunist, seizing on propitious circumstances to produce a good picture whatever its subject or its message may be."—*Henry Clay Gibson in "Films in Business and Industry." (McGraw-Hill Book Company, Inc.)*

AROUND THE WORLD WITH MAGNASYNC



tokyo (Japan)

The prosperous, expanding Japanese motion picture industry is finding in Magnasync the perfect solution to systematic growth The montage at the left shows part of the complete systems installation in K R C Studios, Tokyo Complete with mixing consoles, 35 mm recorders, dubbers and electrical interlocks, this well planned system can be easily expanded to keep pace with the growth of K.R C. Studios

Other Magnasync 'sound-system' installations in Japan include the Fuji Television Studio, Tokyo, Radio Tokyo Studio, Tokyo, Kansai Television Studio, Osaka, and Chubu Nihon Broadcasting Corporation, Nagoya

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events occur at the very end of the quarter it becomes obvious that a complete script cannot be written until shooting is completed. Thus, a very important factor in this type of film production is the ability to make accurate estimates, through research and liaison, of the individual importance to the projected film of events as they occur. Motion pictures other than these special reports are always produced with standard script, photography and editing techniques.

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As is usual in an industrial motion picture department, an ever-present problem which must be handled with tact and diplomacy is the tendency of engineering and technical personnel to minimize the importance of the motion picture effort. It must be emphasized here, however, that this problem is not indigenous to Aerojet, but to almost all industries having photographic departments. This attitude is usually due to an unfamiliarity with the problem involved in getting good motion picture footage and, sometimes, a lack of understanding of the differences between still photography and cinematography. In addition, these people are understandably impatient with anything that interferes with their time schedule and programming. Since the filming of these pictures is as much of a contractual obligation as the production of the product, the problem of obtaining maximum cooperation from technical personnel becomes of primary importance to the success of the film project.

Coupled with this erroneous tendency to be regarded as "overhead," the film department also has the problem of acting personnel. All the actors participating in Aerojet films are amateurs, running the gamut from mechanics to engineers. It seems they are either camera-shy or love to "ham it up"; in either case it is the job of the two motion picture departments to strike a happy medium.

Aerojet's motion picture units also produce a variety of films for Customer Relations, Public Relations, and contractual, training, and engineering progress reports. The units are well-staffed with experienced personnel, whose duties are described in the following paragraphs:

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visor, the producer is responsible for the initiation, preparation and conduct of motion picture productions, seeing them through all phases of production to final acceptance. He is the operating head of the motion picture group.

Writer-Director. Under the technical supervision of the motion picture producer, he is responsible for the direction of all technical and artistic personnel in the translation of the motion picture script into a complete motion picture. He exercises professional judgment in all aspects of the motion picture effort based on accepted standards of the motion picture industry as to cinematography, lighting, sound recording, acting, editing, special effects, etc.

Film Editor. Under the direction of the producer and/or writer-director, he is responsible for the editing and cutting of motion picture films and optical and magnetic sound tracks. He handles the disposition and/or storage of original film and prints.

First Cameraman. Under the direction of the producer and or the writer-director, he acts as director of photography for all motion picture filming. He is responsible for the correct disposition of lighting and camera and sound equipment and related cinematography requirements. He interprets the filming requirements of a motion picture script into visual, graphic form through the medium of the motion picture cameras. He is responsible for the activities and direction of the assistant cameraman, gaffers and electricians and grips and sees to it that all necessary equipment is available and in working condition when required.

Assistant Cameraman. Under the direction of the first cameraman he is responsible for the production cinematography in all its phases involving camera, lighting and sound equipment and performs all duties necessary to produce documentary motion pictures. He must be capable of loading all cameras and magazines, roughing-in lights in sets, reading exposures and color temperatures, and handling slates, tapes, camera logs, and related equipment. He works with the first cameraman to the fullest extent of his experience and ability.

Grips. Under the direction of the first cameraman grips are responsible for all manual labor involved in preparation of motion picture filming.

All photography is done in 16mm color. Most of the many functions pertaining to efficient film production are performed in the plants with the exception of sound recording and processing which are supervised by the film groups but performed in various commercial laboratories in the Los Angeles area.

Equipment used by the groups includes Mitchell and Arriflex cameras, several 16mm Bell & Howells, which are used mainly for test firings, Magnasync and Kinevox magnetic recorders, Moviolas, necessary editing equipment, as well as a large number of set-lighting units such as junior and senior floods, skypans, Colortrans, etc. A substantial part of Aerojet's film production is carried out in the development and manufacturing area, which requires the use of artificial lighting. Here, portable generators supply the necessary power for illumination.

Aerojet has always been cognizant of the importance of employing experienced personnel in its film production units. Frederick B. Gierman, who heads up the Motion Picture Unit of the liquid fuels rocket division, has a record of thirty years' experience in motion picture production and has produced more than 50 documentary films, many of which depicted the construction and operation of power dams in the Pacific Northwest. This one-time movie actor's experience also includes extensive writing and directing.

John Myers is writer-director in the same division. He has a record of many years experience with industrial and aircraft firms as a technical engineer and writer.

Ralph Rose, Jr., writer, has a broad background in script writing for industrial film productions and television. He has written video dramas for Matinee Theatre Kraft, and G-E Theatre.

Frederick Johnston, 1st Unit cameraman, studied photography at Art Center School in Los Angeles, later operated his own commercial photography studio, shooting both motion pictures and stills.

William Reilly, cameraman, attended Signal Corps school at San Luis Obispo, California in 1953. He was a Signal Corps aerial cameraman in Korea before he joined a commercial photography firm in Sacramento. From here he went to Aerojet.

In the Solid Fuels Rocket plant, Don A. Rivers heads up the unit as film producer. Before he joined Aerojet two years ago, he produced films for television and industry, then went to Universal International studio as a writer and assistant-director.

Mitchell Rose, writer-director in the same unit, received a BA in motion picture production at University of California in Los Angeles. He subsequently joined the Air Force where he was Project Officer in a film production unit. With Aerojet eight months, Rose has directed five pictures for the company.

Dan Leto, film editor, has a background of 12 years experience in motion pictures—mostly industrials. Was formerly with Soundmasters in New York, and was a cameraman in the Air Force for six years.

As the missile and space industry grows, the art of cinematography grows. Dr. James H. Doolittle, Chairman of the National Advisory Committee for Aeronautics stated recently, "So far as space technology is concerned, we are at the early stage of development comparable to that of the airplane a half century ago." The missile industry has opened a whole new field of industrial cinematography, and the men who man Aerojet's cameras are no less pioneers than the men who design our missiles and satellites. Perhaps they too will lead the way to new and exciting, unexplored areas in the art of the motion picture. ■

ANIMATED FILM

Continued From Page 695

scene added or one taken out, or some other story alteration proposed and outlined for the animator's attention. The basic purpose of the projection room sessions, however, is to check on the animator's work, and perhaps to okay it so that he can advance the production one step further toward completion.

If the first film test of the rough action looks all right to the director, the okay is given to "clean up" the drawings, preparatory to the processes of inking and painting.

"Cleaning up" involves making the final, detailed drawing that will be traced onto the cell by the inker. It's usually done by the animator's assistant who edits the rough extremes down to a careful drawing, with true shapes, proportions and sizes. Sometimes, however, a cleaned-up drawing

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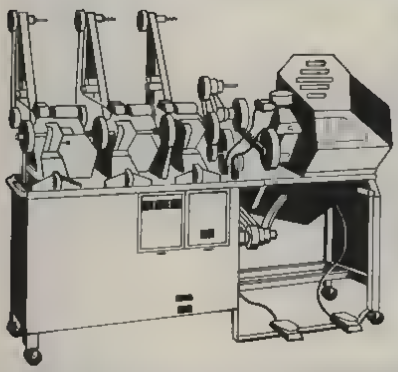

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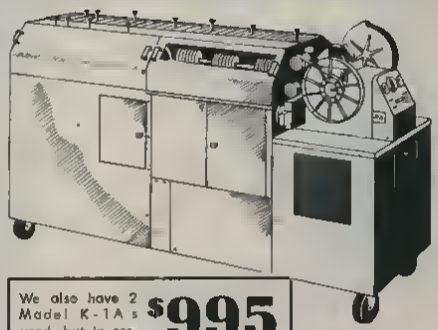

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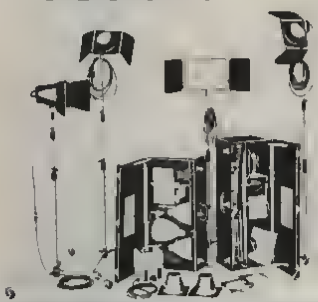

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has a "tightness" that many animators bemoan, for they feel their first rough has a freedom and spontaneity that is lost as soon as the drawing is reduced down to a form with a single outline No doubt this is true, but the necessity for cleaning-up the drawings is one of the practical requirements imposed by the assembly-line system of cartoon production If every line on the drawing didn't mean something and retain a consistency of placement, the inker, when tracing the drawing onto celluloid with a single hard pen line, wouldn't know exactly what pencil lines to trace in defining a certain form, and the painter wouldn't know the exact limits of the area on which to apply the paint

Efforts have been made to soften the harshness of the inked outline by using colored inks, and to alleviate the flatness of the painted character by applying tones and shadows by the air-brush or dry-brush methods These measures have been reasonably successful, but usually involve a great deal of extra expense Another attempt to remove the curse of the hard ink outline is a special process whereby the pencil drawing is transferred directly onto the cells by photography, for even the pencil outline, uncompromising as it is, has more softness than an india-ink tracing of same ■

(To be continued)

SINGLE-SYSTEM MAGNETIC SOUND

Continued From Page 696

produced on the same magnetic head of a projector The laminated type magnetic stripe on the emulsion side has been successfully employed in our operation. The use of the wet type magnetic stripe on the emulsion side is not at present satisfactory because of a processing problem The manufacturer is continuing investigations relating to this and we believe that this method will also prove satisfactory.

The increase of the film roll diameter with the addition of the magnetic stripe has also been evaluated The average thickness of either the wet or laminated stripe is approximately 10% (0.6 mils) of the average overall film thickness The diameter of 400 ft. and 1200 ft. rolls of raw stock is increased by approximately 5% with the addition of the stripe Film magazines for 16mm cameras, in general, provide a greater tolerance for roll diameter than this 5% average However, it is conceivable that a problem will exist when film magazines of certain manufacture are employed with film of maximum thickness which has a magnetic stripe of maximum thickness While we have not experienced this difficulty, we believe the design of new equipment should consider the desirability of increasing this magazine dimension to provide adequate clearance for striped material.

In introducing the technique of striped magnetic sound recording into an operating program, the desirability of not interrupting operations must be considered For this reason, a camera conversion which provided the means of producing both photographic and magnetic sound interchangeably was selected The "Filmagnetic" design for the Auricon 16mm cameras as provided by Berndt-Bach, Inc. and which we first tested in 1955 has proven satisfactory in our program This conversion allows us to utilize existing equipment for photographic single-system sound as well as for the improved quality magnetic sound.

With the use of striped film in a camera, the possibility of excessive magnetic head wear and/or wear of various camera parts by abrasive action of the magnetic oxide is being carefully watched. Cameras are periodically checked and all camera parts within the film path are inspected After operation with over 100,000 ft of striped magnetic material with a specific camera, the frequency tests indicate no substantial change in response and there is no evidence of wear at the film gate or at any other part of the camera

The presence of the magnetic stripe on the base side of the negative film material does not adversely affect the flatness of the film plane at the camera aperture The camera pressure plate is spring loaded and successfully positions the film to avoid any resolution loss. Resolution chart tests comparing film with no stripe and pre striped film have shown no measurable difference The lens used in these tests was set at the maximum iris opening to provide a minimum depth of focus.

In addition to the improved quality of striped magnetic sound, the use of this recording technique provides a distinct operational advantage in the ability to monitor a sound record as it is produced. This allows for adjustment of certain sound problems during a recording and, most important, equipment failures are immediately evident

Both the wet and laminated types of pre-striped negative film have been processed in immersion and spray types of developing machines There has been no evidence of any adverse effect on the magnetic stripe, the picture area of the film, the processing machine or the developing solutions In a specific test, 9,600 ft of striped material were processed on a spray type machine with solution temperatures maintained at 80°F Sensitometric strips at the beginning and the end of the 9,600 ft as well as between each 1,200 ft roll indicated no measurable difference in gamma, density or chemical fog level A similar quantity of pre-striped positive film with the stripe on the emulsion side has been processed under the same controlled conditions The results in this case were identical to those in the test of the negative material In the case of the positive material, the laminated magnetic stripe apparently seals off the photographic emulsion from any action by the processing solutions

Negative and positive films are employed in our operation, but our experience with reversal film stocks is limited However, reversal film with a magnetic stripe has been satisfactorily processed. A normal reversal processing procedure does not employ any solvents which will adversely affect the magnetic stripe and we do not believe that any processing problems will be encountered Our experience with photographic materials which employ the

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type of antihalation backing which is removable in processing is also limited We are currently conducting investigations which we believe will indicate that processing of such film can be accomplished satisfactorily. We base this belief on the assumption that the magnetic stripe material will seal off the backing in the same manner which has been evident in processing of positive material with the stripe on the emulsion side.

Editing of the full-coated magnetic film has been a successful operation for a number of years. Editing personnel are experienced with the procedures, and striped magnetic material presents no new complications Commercially available film viewers, splicers, splicing cements and magnetic sound readers are satisfactory for operation with striped magnetic film Synchronizers and footage counters equipped with magnetic reproduction heads are now available.

Sixteen millimeter review type projectors which provide for the reproduction of striped magnetic sound are available But the semi-professional projectors are, in general, not capable of reproducing the full frequency range of striped magnetic sound and the film motion introduces a high percentage of wow and flutter If professional projectors like the Bell & Howell "JAN" or the Eastman Model 25 are available for quality evaluation, the semi-professional projectors can be utilized for the editing operation The magnetic sound reproduction feature is commercially available on the "JAN" projector A developmental model of a magnetic sound reproduction attachment for the Eastman Model 25 projector has proven satisfactory in our evaluation and it is hoped that such an attachment will be commercially available in the near future

Striped magnetic sound provides a distinct editing advantage as compared to single-system photographic sound. In editing news film it is frequently necessary or desirous to retain certain picture material. Because of the 26 frame photographic sound advance, unwanted sound material is also included There is no practical means of quickly removing this photographic record. With magnetic sound, this portion can be quickly and easily deleted by a simple erasure procedure

The binding materials employed in the manufacture of the magnetic stripe are soluble in various chemical solutions With certain film cleaners it is possible to damage or even completely remove a magnetic stripe. This problem will be encountered if the solvent of the film cleaner is the same as that employed in the manufacture of the magnetic material. Trichlorotrifluoroethane, which is commercially available from the DuPont Co as "Freon 113," has been found to have no detrimental effect on either the wet or the laminated stripe.

At least two manufacturers of 16mm television projectors have offered the magnetic sound reproduction feature for some time. Unfortunately as far as the utilization of striped sound is concerned, these makes of projectors are not predominantly in use at television stations. However, the two manufacturers of the 16mm projectors which are in use in the largest number of stations have completed experimental models of magnetic sound reproduction attachments for their equipment.

In our operation with magnetic sound, we have employed the developmental model of the magnetic sound reproduction attachment for the Eastman Model 25 television film projector In brief, we have found the performance of this attachment to be completely satisfactory

With presently available equipment it is possible to produce magnetic or photographic prints from original negative with striped magnetic sound. But this operation requires the use of recording equipment in a double system type of production, which is too time consuming to be practical in general television news work

To overcome this time obstacle a special magnetic sound to magnetic sound reproducer attachment has been added to a Bell & Howell Model "J" 16mm printing machine. This attachment provides the means for producing prints with striped magnetic sound on the original negative in a single-system type of operation The equipment is capable of reproducing sound with no apparent loss in frequency range or signal-to-noise ratio and without the introduction of wow and flutter disturbance or distortion. A further step, now in design, will make the same machine capable of providing either magnetic or photographic sound on prints within the same time as is now required in photographic single system printing. Both magnetic and photographic sound for prints will likely be required for an interim period.

In conclusion, we believe the quality improvements and operational advantages available with pre striped magnetic sound are substantial for 16mm television news and documentary type film production. But in our operation the transition from photographic single-system production to striped magnetic sound is a relatively slow program. CBS News programs are not as yet completely utilizing magnetic sound The percentage of use is however, increasing We respectfully submit our prediction that single-system photographic sound will give way to the improved production medium of pre-striped magnetic sound ■

AUTOMATIC FOCUSING

Continued From Page 687

rugged servo system to move the lens (or mirror) until once again the plane of sharpest image focus intersects the mid-point of the sensor's oscillatory travels

Where the OAR system is to be used for automatic focusing of a lens on an operating motion picture camera, the system would be set up so as to utilize a portion of the light gathered and focused by the lens itself, as diagrammed in Fig. 1 This would involve use of a motion picture camera having a mirrored shutter that would intercept and deflect the light from the camera lens into the OAR apparatus. Cameras such as the Arriflex and the Camerette—both of which have reflex viewing systems involving mirrored shutters—are ideally suited for conversion to the OAR system of automatic focusing control.

An OAR application for automatic focusing of a TV camera, which has no such intermittent shutter, would probably be served best by a matching lens of its own, identical with and moving with the taking lens of the TV camera.

Another possible OAR application to automatic TV camera focusing would split the light from a single lens, so that part of it is analyzed for focus by the OAR sensor, while the remainder forms the photographic image that will be transmitted to the waiting video screens.

For its many non-photographic applications, however, the OAR system requires only the single focusing lens

or mirror system to gather the optical information which OAR is designed to interpret and act upon. Tests of first models have shown that it does so with amazing accuracy and dependability, according to research director Greene.

Operation of the actual OAR test apparatus gives an impression that is both uncanny and confidence-inspiring. Once the "on" switch has been flipped, it stands alone unattended by anyone. Compact and unobtrusive, it resembles something new in small motion picture or filmstrip projectors. It is silent, except for the slight 60-cycle hum of its hidden oscillating "sensor" element. The lens looks out quietly, almost indifferently, at a distant wall.

Then, half as far away, a screen is quietly put up within "sight" of the lens. Immediately the OAR mechanism mutters quietly, the servo-rod shifts the lens forward a little, and focus has been re-set to fit the shorter distance between the lens and what it now "sees." From a pre-calibrated strip near the lens barrel, the distance of the screen can actually be read.

Another difficult task for any automatic focusing system is responding correctly to a "sighted" object that is darker than its more distant background. A silhouetted subject, in other words. The prototype OAR apparatus showed that it can focus accurately on such an object, provided only that some part of the object's illuminated edges fall within the central sighting line of the lens. OAR's oscillating sensor reads these edges at their actual distance from the lens, not at the greater distance of the illuminated background, which may be many times as far away.

This means, for instance, that OAR should correctly "range" the distance of a person standing in front of a far-off illuminated backdrop, or even silhouetted against a lit sky. Though such situations may not arise often in the over-all uses of OAR, this does represent a real asset, said Greene.

During initial tests of the pilot model, one interesting kind of ambiguity was shown by the OAR apparatus. This happened when its lens was pointing at the highlights of some chrome decorated autos parked in the hot sun of San Fernando Valley outside the offices of Comapco, Inc. The apparatus, instead of quickly arriving at a new focal adjustment and holding it, began

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persistently to see-saw back and forth from one lens setting to another, as if unable to make up its mind which to retain. Checkup by Comapco engineers disclosed that the apparatus was alternating between the nearer focal setting suited for the distance of the sun itself (infinity!) and the more extended lens position corresponding to the distance to the reflecting chrome trim on the cars (possibly 100 feet away).

After all, who is to say which was the correct distance to the source of light in this case? OAR played safe, and indicated both distances, alternately. However, a method has now been developed for overcoming this "double distance" effect caused by the sparkle of reflected highlights.

Sole source of power for the OAR prototype is standard 100-115 volt 60-cycle alternating current, such as is supplied in standard households throughout the land. This actuates not only the vibratory motion of the sensor element, but also the two amplifiers and servo-motor systems.

With or without human attention, the OAR apparatus "watches" and "acts." For example, take a situation where the apparatus is set up in a courtyard with the lens pointing toward a distant wall. Unexpectedly, a man walks across the yard, his figure momentarily intersecting the lens' line of sight. Instantly, the adjustment of focus takes place: the 60 cycle hum of OAR gives way to a slight mutter as the servo rod pushes the lens further out, and the new focus is held momentarily on the nearer object of the man. A moment later, after the man passes from view, the servo-rod automatically pulls the lens back to its previous setting and the system is restored to normal.

For automatic focusing applications of OAR, Greene explained, the apparatus' sensor element must be slightly more complicated than has been indicated thus far. If, for example, it consisted solely of a single photo-electric cell to which light from the lens was admitted through a tiny hole or slit, then the system would be vulnerable to what is sometimes called the "tilt effect." This is a short name for the distraction caused by illuminated objects positioned slightly off the center line of the lens. Elimination of this kind of confusion was one of the early major problems encountered, and represents one of Greene's important achievements in perfecting the OAR System.

The basic operating pattern of OAR remains the same, whether it is operated through the radiant energy of light or of heat vibrations. This pattern has five essentials:

(1) The focusing lens or mirror system.

(2) The uniformly and continuously oscillating sensor element, moving along the axis of the lens or mirror to explore and report energy distribution.

(3) The two-times-oscillatory rate of signal fluctuations from the sensor when the mid-point of its oscillatory travels coincides with plane of focus.

(4) The decrease in rate and the dis-phasing of the sensor's signals as the focal plane is separated farther from the mid-point of its motion.

(5) The resulting immediate and readily-interpreted passing on of these signals to the servo-mechanism, which at once makes whatever mechanical movements have been predetermined to return the plane of focus to the mid-point of sensor motion.

Development work on practical applications and improvements of OAR methods are proceeding under guidance of Research Director Greene.

First tests with OAR prototype apparatus have yielded encouraging indications as to possible accuracy of distance determination. Greene believes it will be possible to achieve an error of less than 2% in automatic ranging, as against errors many times as large which are common in the use of conventional optical range-finders which work on the "split image" principle.

OAR's basic accuracy of measurement increases with the increasing frequency of the radiation used. Thus ordinary visible light yields greater accuracy than the longer infra-red vibrations; and ultra violet light, in turn, offers greater accuracy than visible light.

OAR has shown an accuracy so noteworthy that few of the available lens systems which have been tested seem to measure up to the full requirements and possibilities of the pilot apparatus, Greene declared. "Our tests so far have emphasized how far from theoretical perfection are the majority of lenses and lens systems," he said. "It appears proper to say even at this early date that the ability of OAR systems to analyze and act upon optical information will be limited by the characteristics of most available lens systems rather than by the possibilities of the OAR method itself." ■

SOUND RECORDING

Continued From Page 690

Now let us consider a 10,000 cycle tone instead of 1005. The magnetic bands now will really be close together—even at 15 ips tape speed. And if the recording is done at 7½ ips the bands will be so close together as to almost touch one another. For this reason it was considered preferable in the past to use a magnetic recorder that operated at 15 ips instead of 7½. Within the last few years, however, the magnetic recording head has been so greatly improved that it now can place the sound bands on a tape or film even closer together without causing undue distortion. For this reason, many present-day 7½" recorders are quite often superior to the 15" recorder of a few years ago.

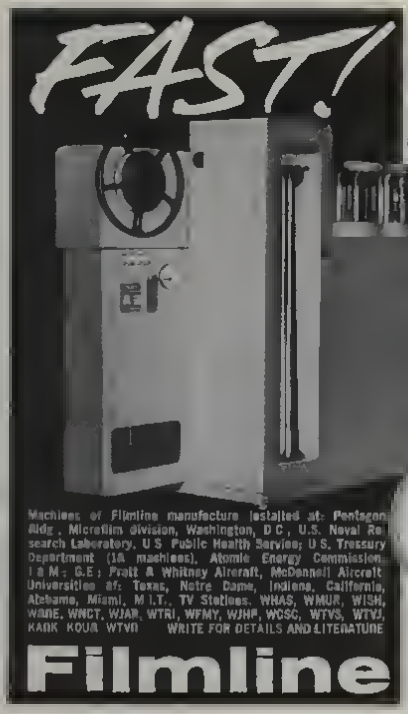
Considering the present general excellence of magnetic tape and film recorders the answer to the question of "What recording method to use?" is an obvious one for those considering doing their own sound recording. There is left only the matters of what make recorder to buy, what tape speed to choose, and whether to choose a tape or film recorder.

On the question of make, no recommendations will be made here. (There are several good, portable tape and film recorders presently on the market—some advertised regularly in *American Cinematographer*—ED.) However, there are some important features and specifications that should be considered when purchasing a magnetic recorder for use in sound film production.

A 15 ips tape recorder should have a frequency response flat (or uniform) from 50 to 15,000 cycles, plus or minus 2 or 3 decibels. Distortion should not exceed 2½ to 3 per cent at most, and the wow or flutter content should not exceed .1 or .2 of 1 per-cent.

For a 7½ ips tape recorder, its frequency response should be from 50 to 10,000 or 11,000 cycles per second. Distortion should not exceed 3 per-cent, and flutter and wow not over .1 to .2 of 1 per-cent. The signal-to-noise ratio for both recorders should be not less than 50 db (decibels).

In all cases, the manufacturer's specifications will be your guide in these matters, and your guarantee of getting what you ordered. Manufacturers are obliged by law to deliver to the buyer a machine that will do what



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the specifications say, so it is well that you learn in advance what these specifications mean in relation to your sound recording requirements, then determine what specifications will satisfy your needs—and buy a recorder that meets them. It goes without saying that the machine should be carefully checked out to make sure that it measures up to the manufacturer's printed specifications.

Until now we have been discussing magnetic *tape* recorders. Let us consider now coated (magnetic) *film* recorders. In the method of recording, the magnetic film recorder is identical to the tape recorder. Only the medium on which the recording is made is different. Film, being less pliable than tape, doesn't have the flexibility to wrap around the recording head as easily as does tape. This sometimes results in poor contact with the recording head and consequently quality is harder to achieve in the recording. Here, consistently good contact of the recording medium with the recording head is important—and is a matter which should receive careful attention when it comes time to select a magnetic film recorder.

As to specifications for film recorders, most of the 16mm film recorders made today operate at 36 feet per minute, which is practically the same speed as the 7½ ips tape recorders. Very good quality may be obtained in recordings with such machines, providing they have the following technical specifications:

Frequency response, 50 to 8,000 cycles per second, uniform or flat to 2½ decibels; distortion 3 per-cent; flutter and wow .2 of 1 per-cent; and signal-to-noise ratio at least 50 decibels.

There isn't a great deal of difference between recorders, the difference being largely a matter of degree. Obviously, it's better to have a recorder that goes up to 15,000 cycles rather than to 8,000. But this can be a somewhat misleading thought. A recorder that has specs of 50 to 8,000 doesn't cut off completely at 8,000 cycles. Above about 8,000 cycles it will gradually drop in its ability to retain the higher frequencies, but some of the energy of the higher frequencies will go on to the film, and the recorded signal will sound better as a result. I've recorded many a foot of sound from 15,000 cycle tape to 8,000 cycle coated film, and it takes a sharp sound man to detect the difference between

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the two materials when they are played back. Of course, there are magnetic film recorders that run at 90 feet a minute that will record nicely at 15,000, but they are used less and less in the 16mm business.

How do you decide whether to use a tape recorder or a magnetic film recorder? Following is a brief but significant list of the good and bad points of each. First, the tape recorders:

Advantages—they are light, some weighing as little as 27 lbs. (We are excluding the pocket size as being unsuited for most commercial film work). You can rewind faster for checking the tape, or in transferring. The recorders pull a light load on a portable generator. In an emergency, it's easier to buy tape in an isolated location than it is coated film. Tape recorders are economical to buy. Tape recorders can be equipped with a Rangertone sync control unit for about $300, thus making it possible to record lip sync. (Some film makers are afraid of this system, but properly used and maintained it's a dependable method)

The *disadvantages* are few in number: The additional expense of putting the sync control unit on. The possibility of the sync control unit not working efficiently. The fact that the sync control unit is dependable only for recording, not for playback—so that you cannot run your sound against picture with the assurance of being in sync. And, the complex problem of editing tape under the various conditions of recording. *In general, it's well to transfer film sound from tape to sprocket-driven coated film and then edit the film or a workprint copy*

Now, the pros and cons of the magnetic coated film recorder:

Not all magnetic film recorders are as light as comparable tape recorders However, some of the newer models are down to around 30 lbs. A day's shooting on film takes up a lot more room than similar shooting on tape. Again, compared to tape, the film machines rewind slower. Some of the larger film recorders require more power from a portable generator (although the newer, lighter models require about the same as average tape machines. It's more difficult to buy coated film in some locations The cost of film materials is more than tape materials.

The film recorder *advantages*: They require no extra equipment of any kind in order to shoot sync. If they are driven by the same power source as the camera they will run in absolute sync, with practically no cause for worry. The recorded film can be directly edited if desired. From this edited film material you can record direct to a printing track, thus maintaining your best quality up to the final transfer optical.

This leaves one specialized type of machine that we haven't discussed—the 16mm magnetic-optical recorder-projector which can be used for the direct recording of sound on release prints, with the prints then used for playback in the same machine. However, it is also used to record sound which is later transferred to optical track In the latter case, there is a considerable sacrifice of quality. Why? Because 1) the recorder-projector is a hybrid machine which must sacrifice some recording quality in the equipment itself, 2) the magnetic coating is narrow in width (with a maximum of 100 mils) and, therefore, doesn't accept as good a signal as conventional tape or film recorders, and 3) the movement of the striped film through the projector is not as smooth as film or tape movement through a recording machine, resulting in further reduction or recorded quality.

However, the magnetic recorder-projector is an excellent machine for a number of specialized purposes. We welcomed its advent because it led many people to experiment with sound motion pictures who might otherwise have long delayed the move, or never attempted it They learned the limitations of this recording device, but they also learned the advantages of using sound motion pictures in their organizations

That about sums up the pros and cons on the various systems of magnetic recording. Within the Calvin Company we use both tape and film recorders, and find them both satisfactory. On location, the decision whether to take one machine or another quite often rests on some personal preference of the engineer, rather than any basic differences in the recorders.

In the next issue we will discuss the additional equipment used in recording sound.

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Continued From Page 700

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Continued From Page 678

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● HAROLD STINE, ASC, "Maverick"* with Jack Kelley Various directors, "Cheyenne"* with Ty Hardin Various directors, "Lawman"* with John Russell Various directors.

● HARRY STRADLING, ASC "The Philadelphia" with Paul Newman and Barbara Rush Vincent Sherman, director

● RALPH WOOLSEY, ASC, "Lawman"* with John Russell Stuart Heisler, director, "77 Sunset Strip"* with Efrem Zimbalist Jr Various directors •

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of pictures was brought out by Mr. Blackburn when he related a conversation he had recently with a prominent agent of film talent and technicians, who at the time was involved in a production setup. The agent had mentioned what the star was going to get for doing a series of three features—something like 1½ or 2 million dollars.

"Tell me," Blackburn asked the agent, "what will the director of photography get on those pictures?"

"It's very simple," the agent said "My star will get a minimum of 25% and a maximum of 35% of the budget The cameraman will get somewhere between 1% and 2%."

Blackburn replied, "Where in hell would your star be, if it weren't for the cameraman?"

. . . Which points up what he had told his listeners earlier in the evening: "Cameramen do not realize what they are giving in service and value to the industry."

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ARTHUR E GAVIN
Editor

Sworn to and subscribed before me this 26th day of September 1958
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Notary Public in and for said County
(My commission expires October 10 1960)

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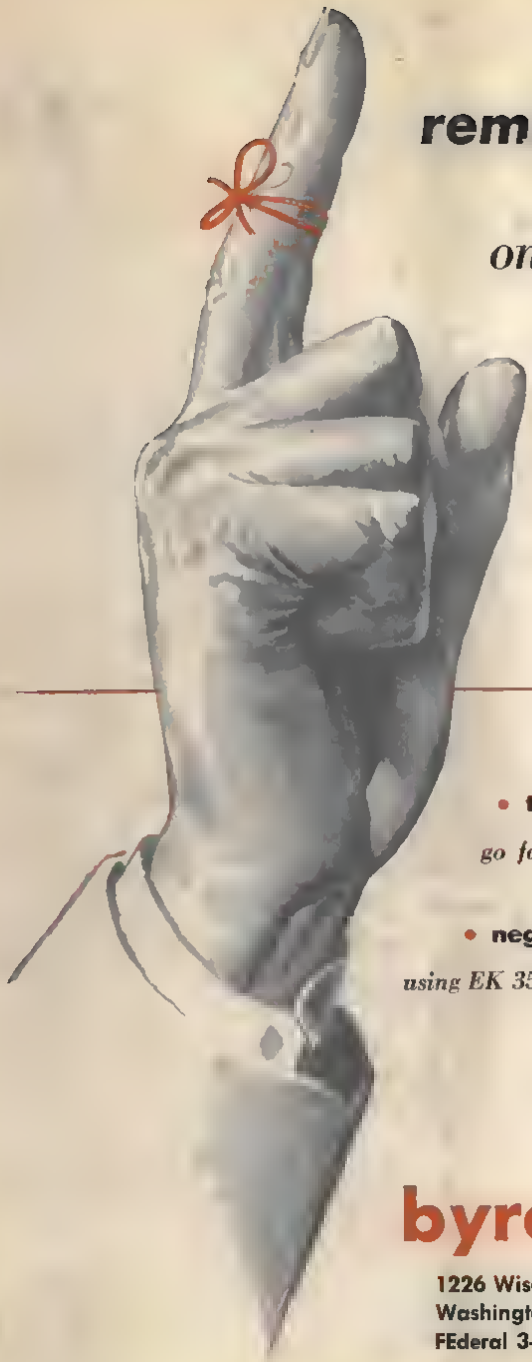

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